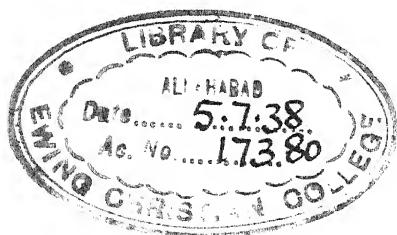


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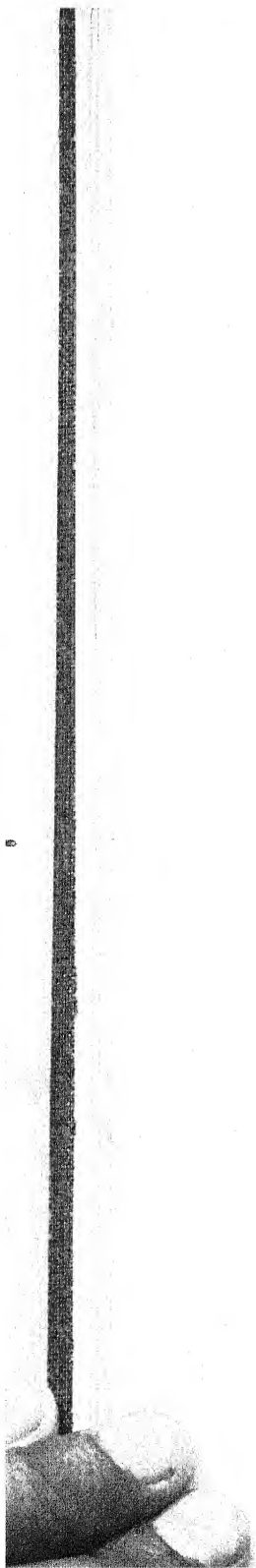
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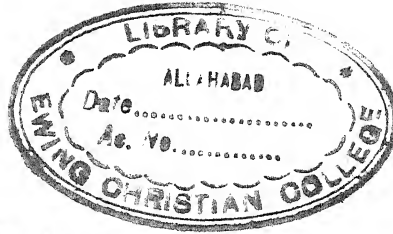
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SECTION I ENGLISH





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A STUDY OF MODERN IRISH LITERATURE, WITH PARTICULAR REFERENCE TO W. B. YEATS AND A. E. (GEORGE RUSSELL) IN TERMS OF HINDU PHILOSOPHY

By MAHESH CHANDRA, M. A.

Method of Study

No sources have been acknowledged since wherever the help of books has been taken it is only to fill in the historical picture and detail. Wherever criticism of philosophical ideas has been made, there was no help to be got from books because no study of the thought of the two poets is available.

The conclusions are mine. In the case of W. B. Yeats, an account has been given of his literary work as well as of his mysticism. There was no question of checking him up by Hindu thought. His mysticism has however been subjected to some analysis to prove how literary and surface-deep it is.

In the case of A. E., however, the narrative method has been given up. Instead, his ideas have been taken up one by one, explained, expounded, and then put in juxtaposition with appropriate Hindu concepts.

This might be a desultory method, but it has its justification in the fact that A. E. as a philosopher has much in common with Hindu thinkers and as such shares many of their ideas and conceptions of God and Universe. Some differences are bound to occur in view of his Western upbringing and these have been duly noted and explained. Extensive quotations from his works have been made to expound his ideas on a particular subject. Sometimes they illustrate a point already made. Portions from his prose works have also been quoted, but often in indirect form, to fit in with the sequence of narration. Even then they can easily be spotted and it was not felt desirable to break the continuity and refer them to their proper context.

The study has been brought to an abrupt close after A. E. though time and opportunity might have tempted me to other English writers, specially when I had my material ready.

I wanted to add another chapter, briefly referring to mystical strains in other English poets. Mysticism has become quite fashionable among the writers of to-day. Of course it is not possible to reduce it to a doctrine; but it would have been interesting just to note the large variety of references ranging from "Creed" to G. K. C. on being in unison with nature.

Of course it is a chance phase, though the reasons for it may be deeper. This would have been useful to set Yeats' alleged mysticism against.

In the very nature of things much space has been devoted to mysticism in this study. Mysticism may not be a philosophy but it certainly does engender a mood which is fruitful in giving much valuable data. The word mysticism is derived from Greek, meaning "to shut the eyes." It signifies an endeavour of the human mind to grasp the divine essence or the reality of things, and to enjoy the blessedness of actual communion with the highest. The thought that is most intensely present with the mystic is that of a supreme, all-pervading and in-dwelling being in whom all things are one.

On the practical side, mysticism maintains the possibility of direct intercourse with this being of beings—intercourse, not through any external media, such as a historical revelation, oracles, answers to prayers etc., but by a species of ecstatic transference or direct identification, in which the individual becomes or in very truth, partakes of divine nature, God ceases to be for him an object and becomes an experience.

Here is a quotation from the article on the subject in the "Encyclopaedia Britannica" to clarify the point: "Mysticism differs therefore from ordinary pantheism in that its inmost motive is religious but whereas religion is ordinarily occupied with a practical problem and develops its theory in an ethical reference, mysticism displays a more predominantly speculative bent than from man and his surroundings taking the symbolism of religious feeling as literally or metaphysically true and straining after the realisation of an ineffable union."

HISTORICAL SURVEY

Literature as distinct from propaganda is a very recent growth in Ireland.

Like nationalism it has a complicated history in which, as is the case with all movements that owe their birth to transitory emotion, the real issues of any permanent value are lost. This factor may not be very harmful in other walks of life but, where the cultivation of a particular art of expression is concerned the results are often disastrous.

Thus it was that cheap political agitation thwarted the growth of a real literature in Ireland for centuries. It is futile to blame the Irishman for this because the arts are a growth of peaceful times when the present security and future prospects of a people or nation are assured.

Ireland was, like India, from where we shall have to find many parallels, unfortunate in her political history. And it was only at the end of the last century that the country could

lay claim to a literature of its own.

We are not concerned just at present with the ancient Gaelic literature, which Ireland had in abundance, but with the recent flood of creative energy that has characterised the movement known as the Irish Literary Renaissance.

To appreciate this literature adequately and understand the part played by W. B. Yeats and A. E. (George Russell)—our subjects of study—we shall have to go into a brief history of the movement and trace a few of the literary origins because, as we shall see, the work of these two Irishmen and their contemporaries is not an isolated phenomenon of creative activity but a direct continuation of the traditions of old Ireland.

What is new is the medium of expression; otherwise their innermost being is shaped and fashioned by the Ireland of the past.

Also, before they came to the forefront, a band of earnest workers, some famous now and others much maligned, had preceded them; and it was due in a large measure to their pioneer work that the new literature in Ireland was made possible.

The antiquarian work of men like Mangan, Ferguson, O'Grady and others was preceded by the fierce political controversies of the poets of the Nation School. The peaceful Yeats of the "Lake Isles of Innisfree" had to fight many a battle before he could hold his own. The bitter controversy that centred on the plays of J. M. Synge may serve as an example.

Sein Fein and poetry formed a bad combination and it was not without a certain amount of truth and feeling that John Eglinton wrote on the necessity of "de-Davisisation of Irish literature."

Anglo-Irish literature was a literary anachronism to the patriots of the "Nation School" and it took a long time to teach the people that this literature did not include the writings of George Bernard Shaw or Dean Swift; but of men whose mistress was "Cathleen ni Houlihan" who followed her "rose-

bordered hem" and heard her speak again through her heroes of the past and the fairies that lived beyond Cannala's well, of men who had a lasting affection for Irish soil, rhythm, music and beauty.

It was in the eighties of the last century that nationalism in Ireland gave way to nationality. Thus it was that the new literature was made possible. For a race that is denied freedom or independence from outside control is a very political race indeed. Art, literature, religion, nothing can be dissociated from political propaganda, controversy or lament.

This was true of Ireland in a much greater degree because the Irish are a very sensitive race; and to make the bitterness of political thralldom more pungent, they had a civilisation and literature that any people would be proud to possess. Living in the proximity of England and the continent and in intimate touch with America, through thousands of Irish emigrants, they were brought in contact with a civilisation without deriving its advantages.

Thus it was a long and bitter fight, through the press, platform and the pulpit that Yeats and his colleagues had to wage before showing their countrymen that literature in its truest sense is an art which is governed by its own laws and not those of a political purpose, that cheap ideas of nationality breed bitterness and turmoil, and that Anglo-Irish literature was not a concession to England but a literature that had found its own right medium and expression.

Like all revivals and movements, the new literature is not an isolated event. Behind it can be traced almost a century of continuous effort which saw the gradual discovery for the popular mind of treasures of ancient Gaelic literature, with its lore of legendary kings and heroes, that have now found their rightful place in the national literature. With the fund of fable and story, the early workers also discovered literary forms of great beauty which the writers of modern Ireland have

now incorporated into the rhythm of their new Anglo-Irish. Thus the famous prose of J. M. Synge, on examination, will be found to be contained in the "Love songs of Old Connacht," collected by Douglas Hyde. Many of the beauties of W. B. Yeats' poems would be found to have been oft-repeated in the pieces collected and translated by George Sigerson.

Such a result sets at nought the criticism that, if language be accepted as a criterion of nationality, the literary revival is un-national and that Anglo-Irish literature is but a phase of English literature. Those who regard literary Ireland as a province of England and those who believe that Ireland loses her identity, once she accepts the English language, are mistaken in view of this new medium of expression that the Irishmen have "evolved," not imitated.

So long as writers have faith in, and cherish Irish stories, legends and traditions, so long will the feeling of nationality endure. It was precisely this desire to preserve and rescue the heritage of old Ireland that gave birth to the literary revival. It is also true, as we shall see, that the Gaelic Movement, which coincided to a great extent with the revival, has played a none too mean part in the development of Anglo-Irish literature. Many of the younger poets have been drawn into the Language Movement and, even those who have held themselves aloof from it, have in their turn been affected by it to quite an appreciable extent.

An obvious parallel in this respect is the rise of Belgium literature. Like the Gaelic in Ireland, the presence of Walloon and Flemish in Belgium is a sufficient guarantee of the new Franco-Belgian literature.

Early Celts

A historical survey of literary Ireland for our purposes need not take us to the labours of Douglas Hyde who for the first time produced a connected narrative of the history

of the early literature of Ireland. All that need detain us is a short account of the ethnic groupings and the nature of the race that early migrated into Ireland and created a literature and civilisation, which, howsoever removed in time from the present people of the land, does exercise an influence on their mind and feeling; an influence which is not merely literary but a fact of their origins; not artificial but a part of their very being.

The Celtic mind to-day as of old when the race was fresh to this world and more intimately tuned to its surroundings, reacts very quickly to the things seen and the sounds heard. It loves the concrete and dislikes the generic note in poetry.

What sort of people were the early Celts? It is just possible that they came originally from those mid-Asian cities that were swallowed up in the desert sands.

They were a fair skinned people, both golden and dark-haired. Spending hundred of years in their wanderings, they came up from the East by way of Egypt. They left their memorial stones everywhere, beginning with Sicily; leaving, as has been found, old place names such as "Coombe Naul" and "dol" in the mountains of Savoy. They crossed and, on their way, peopled parts of France and finally came into Ireland, making slaves of the original inhabitants in the orthodox fashion of conquerors.

These travellers were subtle and skilled musicians using the difficult scale of sixteen notes. They were learned in the movements of the stars, able smiths and fine decorative artists. It is now known that many of the kings and rulers of contemporary Europe sent their children and courtiers to Ireland for their education in the liberal arts.

These early conquerors of old Ireland understood husbandry and the arts of weaving and dyeing. They were poets both melodious and eloquent.

Their Gods were like the Greek Gods—mighty forces that

played like dangerous children in vaster human shapes, moving parallel with human affairs and occasionally crossing the translucent boundaries that separated them from the sight of men. The fairies of later date often suggested dwindling Gods, mixed up with the fancies of children and the queer little things that one sees in a twilight.

In temper the Celts were fierce and brave. Their priests were skilled in telepathy and the art of mesmerism. Beyond and above their playful gods reigned a higher force, the natural awe of an unknown might. This was the essence of their religion and its verity made them ready to receive the mystical doctrine of Christianity.

There is abundant evidence to show that the doctrine of metempsychosis (belief in rebirth) was perfectly familiar to the pagan Irish, as may be seen from the stories of the birth of Chuchulian Etain, the two Swine-herds, Conell Cearnach, Tuan MacCairill and Aedh Slane. But in the existing literature, there is no evidence that the belief was ever elevated into any philosophical doctrine of general acceptance; still less that there was ever any stress laid upon the belief of rebirth.

Out of the confused mass of records, sometimes primitive and barbaric and sometimes purposely mystified (the Druids were professional mystifiers) one gets the sense of a race, creative in art; used to wrestling in their mind with the unknowable; in their daily life with the hardships of nature and their own ferocities—and this too not without zest and enjoyment.

They were beautiful; their ruling class very beautiful; and though this class, almost the whole of it, perished violently, the flush of beauty survives in their records which the modern writers of Ireland have made their own.

The poets of that time had the broad freshness of mind obtained by considering the movements of the stars, the coming and going of light, and the causes of the wind.

This, since the present study has been undertaken primarily

with a Hindu bias, necessarily recalls to mind the early Aryans who inhabited the soil of India and developed from crude but natural beginnings a vast system of thought which, poetically and literally, does not differ, except in degree and pitch, from the early efforts of the Celts, who had similar emotional recoils and adjustments to make, when brought in contact with the vast but mysterious phenomena of nature.

This fact is interesting from our points of view, for in our study of the modern poets of Ireland, who go back to old times, we shall constantly be confronted with instances in which an attempt has been made to reconstruct, if not always to re-experience, the thrills of the old Irishmen in their desire to reduce their incoherent mass of emotions and feelings into a systematic interpretation of the universe.

The success achieved is a case of individual enterprise; that the results often lead into superstitious beliefs and dogma is no matter of surprise or shame but a fact of historical biology.

Thus India too passed through a stage in which superstition and thought were in conflict. We have in the Rig Veda the impassioned utterances of primitive but poetic souls who seek refuge from the obstinate questionings of sense and outward things. They contemplated the beauties of the sky and the wonders of the earth and eased their musical souls by composing hymns. Others of a more active and practical temperament tried to adjust the world to their own purpose; and thus, in the stress of battle, such utilitarian deities as Indra were conceived.

The genuine philosophic impulse, the desire to know and interpret the universe for its own sake, showed itself only at the end of the period of storm and stress. It was then that men began to doubt the gods they had ignorantly created.

The early Irishmen did not doubt the gods they had

created ; they brought hosts of fairies and lesser beings, to the help of their more powerful editions.

Early Workers

Thus much for the early Irishman ; but it is not a far cry from the Gaelic Ireland to the Ireland of the Revival. The continuity of belief, feeling and legend exists. The link that binds the two Irelands is strong and durable and has stood considerable strain. It would not have, if a band of Irishmen had not come forward to explore, reclaimed and reconstructed the story, song and legend of old Ireland. Among them the names of Mangan, Ferguson, O'Grady, Sigerson and Hyde will ever remain memorable.

Continuity of Link

It was not till the "Stage Irishman" of the "Nation School," with his fierce political nationalism, gave way to others in the field and the definite eclipse of the Irish language took place, that genuine Anglo-Irish literature made its beginnings in the nineteenth century. As is natural, in the early stages, there was not much to distinguish it from English literature, though in Moore, Englishmen for the first time caught the beauties of the Irish Muse. But the country had to wait for the work of James Clarence Mangan and Sir Charles Ferguson before it could disport a literary tradition of its own.

Jermiah Joseph Callan, though essentially English, had, in a small measure, worked on the lines that Mangan was to follow. He in his "Outlaw of Lochlene" and the "Passionate Dirge of O'Sullivan Bear" (translations) gave an inkling of the treasure that was shortly to be unfolded.

Callan died in 1839. Three years after his death the "Nation" was founded, which, despite later day criticism, had an important role to play in the Revival. If nothing, it was a

symptom of the coming awakening. It did much more: it rallied a mass of emotion which, though political in its nature, resulted in a volume of poetry being poured into its columns. Obscure peasant girls and well-known men succeeded one another in its pages. The paper, the organ of "the Young Ireland Party," was founded by Sir Charles Gavan Duffy to awaken the spirit of Irish nationality. The sincerity of the efforts of Davis, who conceived the idea of enlisting the support of the poets, won the praise even of men like Lord Macaulay and Lord Jeffry. Davis' "Lament for the Death of Owen O'Neill" was the first of the series of national songs and ballads which later became famous as the "Spirit of the Nation."

Mangan

Mangan alone of the "Nation Poets" had a genius that transcended the stress and turmoil of contemporary life. With an innate love for the culture and literature of Celtic Ireland, he gave the first utterance to the dormant spirit of the land he lived in. Something more than contemporary history, and more genuine than political controversy was needed to make him give of his best.

Under the stimulus of some Gaelic song or legend he could forget his surroundings and create things of beauty like the now familiar "Dark Rosaleen." From the squalor and misery of his own private life he could lose himself in the hopes, laments and memories of an ancient Gaul. Apart from Gaelic sources, he is as common-place as Moore. But under requisite stimulus, in him was heard for the first time the authentic voice of Celtic Ireland. A herald of the coming of the new poetry, he shewed a way of escape from the dominance of England which had characterised the earlier literature.

Ferguson

Sir Charles Ferguson achieved by the aid of his vast learn-

ing and scholarship, what Mangan did by his uncertain and fitful inspiration. Ferguson, as a student of ancient Gaelic had direct access to its hidden treasures, while Mangan could only obtain glimpses in translations. Ferguson's poetry was the result of years of antiquarian labours and as such was a veritable treasure house for all future poets.

The "Hibernian Nights Entertainments" and other tales (published in the "Dublin University Review" and the "Blackwood's Magazine") were the early fruits of his work. They were an attempt to put into circulation the legends of Old Ireland. In 1867 he published his "Lays of the Western Gaul" followed in 1872 by the more ambitious epic of "Congol." A volume of collected "Poems" appeared in 1880 and attached itself directly to the "Lays" by its treatment of further incidents in the Red Branch legendary cycle. These two memorable works gave a strong impulse to the revival of Irish legend and story, which marks a distinct stage in the development of Anglo-Irish literature. As such they have to be judged by their relative rather than intrinsic merits. For Ferguson above all was primarily engaged in antiquarian work, reconstructing the Gaelic past. Therefore it is unfair to expect from him that jealous care for form and expression that characterises an exclusive work of poetry.

Besides this, he had to encounter many difficulties that every pioneer is bound to meet. For instance, he had to subdue a host of Gaelic names and words and find their euphonious equivalents in his English renderings.

The work of restoration demanded both learning and imagination which were present in him in considerable degree. Thus he could see the past with the eyes of a scholar and interpret and transmit it with the feelings of a poet. Herein lies the secret of his greatness and appeal to posterity.

When he died in 1886 Yeats had published his "Mosada" the revival had borne its first fruits and no better estimate of

Ferguson's work can be given than in the words of Yeats :

"The author of these poems is the greatest poet Ireland has produced, because the most central and the most Celtic. Whatever the future may bring forth in the way of a truly great and national literature.....will find its morning in these three volumes of one who was made by the purifying flame of national sentiment, the one man of his time who wrote heroic poetry."

O'Grady

Mangan and Ferguson had successfully interpreted a wider and finer nationalism. They lifted Irish poetry out of the noisy clamour of politics, and effected that dissociation of ideas which is characteristic of the writers of to-day. But the intermittent flashes of Mangan's wayward genius and the conscious scholarship of Ferguson were not enough to bring about a full awakening. The times demanded a writer who could combine the imaginative intensity of Mangan with the attainments of Ferguson.

About 1872 a young student was forced to spend a wet day indoors in a country house. While exploring the bookshelves there, he came upon three volumes of O'Halloran's "History of Ireland," thereby making an important, though not new, discovery that his country had had a great past. Flushed with excitement at his find, the raw youth rushed to the archives of the Royal Irish Academy. A few years later he introduced himself to the public as Standish O'Grady, a name which has since been associated with every form of literary, political and economic activity in the land.

His "History of Ireland : Heroic Period" in 1878 marked the advent of a new spirit and the work, with its concluding volume in 1880, must be regarded as the starting point of the literary revival. The history is in prose and it is queer that from it should proceed a great stream of poetry—a reversal

of the orthodox process of literary evolution.

But the new literature is not a historical growth in the strict sequence of events : were it so, we could not have jumped from the casual reference to ancient Gaelic to the nineteenth century. It was, on the contrary, a new beginning brought about by the discovery by Irishmen of a vast fund of historical tradition. Ireland already possessed literary forms, handed down from time immemorial and used by Anglicised writers; yet the new literature was not concerned with these but with new subject-matter, brought to light by antiquarian research.

O'Grady's book is a peculiar creation. It does not conform to any of the standard conceptions of history, a reason why it served its purpose so well. It was a book for the Irish people, not school men. Its aim was not to give a precise narration of events, but to rekindle the past with a poetic fervour that would be catching. Here was faithfulness to emotions and feelings and not to chronology. The book interpreted the spirit of old Ireland; with its vast lore and picturesque institutions. Historical work had been done before and in sufficiency: O'Grady shaped his materials into a living whole with an irresistible national appeal.

With the fire of imagination, he transformed historical ore into flaming gold. The result was that the heroes of old, the mere shadows that flitted across the publications of Gaelic and Ossianic societies, now became living beings and moved and talked in a world that was intelligible for the first time. Here is O'Grady's description of old Ireland as he sees it:

"But all around, in surging tumultuous motion come and go the grotesque, unearthly beings that long ago emanated from the bardic minds, a most weird and mocking world. Faces rush out of the darkness, and as swiftly retreat again. Heroes expand into giants and dwindle into goblins, or fling aside the heroic form and gambol as buffoons; gorgeous pala-

ces are blown asunder like smoke wreaths; kings with wands of silver and ard-roth of gold, move with all their state from century to century; puissant heroes, whose fame reverberates through battles, are shifted from place to place—buried monarchs reappear. The explorer visits an enchanted land where he is mocked and deluded. Everything is blown loose from its fastenings. All that should be most stable is whirled round and borne away like foam or dead leaves in a storm”.

Such was the world that Standish O’Grady gave to his countrymen to build their future songs upon, and enabled them to create a literature which was Irish in form and matter though expressed in an alien tongue. Even this alien tongue caught new effects and beauties in music, rhythm and diction.

O’Grady set out his aims: “I desire to make the heroic period once again a portion of the imagination of the country.... If I can awaken an interest in the minds of our people in the career of even a single ancient Irish King, I shall establish a train of thought which will advance easily from thence to the state of society in which he lived and the kings and heroes who surrounded, preceded or followed him.”

In his “Bardic History” was found the authentic voice of pagan Ireland. Modern Ireland found its epic in the story of Cuculain. There was not a single important writer of the literary revival who did not in a large measure owe a debt of gratitude to O’Grady. A .E., whose mind and work are perhaps most akin to his, shows continual traces of him and has repeatedly testified to it. Todhunter’s “Three Bardic Tales” are a direct result of contact with O’Grady’s legendary heroes, while W. B. Yeats has directly and indirectly admitted his debt to them.

Another way in which O’Grady helped the revival was by founding the “All Ireland Review” which became the rallying point for culture and ideas, and the soil from which some of the

of the orthodox process of literary evolution.

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ces are blown asunder like smoke wreaths; kings with wands of silver and ard-roth of gold, move with all their state from century to century; puissant heroes, whose fame reverberates through battles, are shifted from place to place—buried monarchs reappear. The explorer visits an enchanted land where he is mocked and deluded. Everything is blown loose from its fastenings. All that should be most stable is whirled round and borne away like foam or dead leaves in a storm”.

Such was the world that Standish O’Grady gave to his countrymen to build their future songs upon, and enabled them to create a literature which was Irish in form and matter though expressed in an alien tongue. Even this alien tongue caught new effects and beauties in music, rhythm and diction.

O’Grady set out his aims: “I desire to make the heroic period once again a portion of the imagination of the country.... If I can awaken an interest in the minds of our people in the career of even a single ancient Irish King, I shall establish a train of thought which will advance easily from thence to the state of society in which he lived and the kings and heroes who surrounded, preceded or followed him.”

In his “Bardic History” was found the authentic voice of pagan Ireland. Modern Ireland found its epic in the story of Cuculain. There was not a single important writer of the literary revival who did not in a large measure owe a debt of gratitude to O’Grady. A .E., whose mind and work are perhaps most akin to his, shows continual traces of him and has repeatedly testified to it. Todhunter’s “Three Bardic Tales” are a direct result of contact with O’Grady’s legendary heroes, while W. B. Yeats has directly and indirectly admitted his debt to them.

Another way in which O’Grady helped the revival was by founding the “All Ireland Review” which became the rallying point for culture and ideas, and the soil from which some of the

best fruits of the revival sprang. O'Grady was also responsible for the publication of "Pebbles From A Brook" by John Eglinton.

Translators

Revival is usually of a thing that the people have ceased to understand because of distance in time, space or civilisations; and hence the great need of people who can interpret the dead past and bring it back to life. In literature the role of a translator is no mean one.

No account of the coming of the literary revival in Ireland would be complete without a mention of the labours of early translators who, by the peculiarity of their position, rendered a dual service to the cause of letters. They translated a vast amount of the literature of the past into a language that could be understood by modern Irishmen. And incidentally they brought to light the intrinsic beauty of the native melodies and verse forms. The translators and those versed in folk-lore collected, transcribed and translated the folk tales and the beautiful songs in which the old Celtic tradition still lived. They were an important factor in the evolution of modern Irish literature.

Though this particular phase of activity rightly belongs to the Gaelic movement, nevertheless some of the writers exercised a profound influence on the coming writers of Ireland. Not to mention their labours and achievement would be a serious omission in interpreting the work of persons of whom this is primarily a study.

Anglo-Irish

The place of George Sigerson among the translators is akin to that of O'Grady. In 1860 he published his "Poets and Poetry of Munster" containing the text of about 50 beautiful Irish poems with their metrical translations which were to be-

come the special feature of the author. The volume marks the beginnings of the revival which made such headway under Douglas Hyde. The "Bards of Gael & Gall" in 1897 met with a spontaneous success. This was unprecedented. But now the movement had set in motion. The National Literary Society in Dublin and the Irish Literary Society in London had come into being; and it was as the president of the former society that Sigerson dedicated his volume to Douglas Hyde, president of the sister society.

A new literature was in the process of formation, which had, by its very nature, attached itself to the regional stem of national culture. Its outer form and texture were alien but it derived its sap from the parent root of Celtic culture. The spirit was Irish, though the medium of expression was English. But even this, as was natural, had taken on something of its environment.

Under the lead and example of Sigerson, the English that the Irish were to use as their language was to become a national entity of its own, with its new rhythm, idiom—and quaintly Irish music.

Sigerson

The metrical translations of Sigerson were the first to demonstrate what could be done with a foreign language. Ferguson and Mangan had caught the spirit of the Gaelic text with obvious difficulty. But Sigerson succeeded in a far more difficult feat; he rendered the music of the original in addition to its spirit. The popular heptasyllabic measure of the Gaelic is essentially alien to the nature of English poetry which falls more easily into lines of eight syllables. With few exceptions. Sigerson's version reproduced this measure. The perfection and diversity of the Gaelic verse forms precluded their illustration; but his volume contains many examples of its ela-

borate structure with its internal rhymes and alliterations, its consonant and assonant rhymes.

Celtic Melancholy

While explaining those verse forms and their technical achievements, Sigerson also traced the growth of those traits which have so completely been identified with Celtic verse. Much has been heard of and talked about "Celtic melancholy." Sigerson offers an explanation or at least an interpretation of this trait. In his anthology he traces the fine feelings for nature with underlying suggestion of pantheistic sympathy. He explains the note of melancholy in Irish poetry and points out its growth and origin. In the dirges of Oisín, lamenting over the death of Fíana, is heard for the first time the note of "Celtic sadness". Oisín, the last of the pagans, mourns the passing away of his companions and all that they stood for in the rising flood of Christianity. It is a conflict between the heroic and Christian ideals, and expression is given to it in the dialogues of Oisín and Patrick. It is a wail over the displacement of paganism by asceticism. It is heard even now.

All the Irish poets have ranged over the side of Oisín and voiced the feelings of regret and sorrow at the loss of a kindred world, where the primitive man and his emotions found full play instead of being surrendered to a life that was forced, external and artificial, a product of the intellect, not the senses, and as such the enemy of all for which genuine throbbing manhood stood for. The writers of Ireland have been transported by the force of imagination and patriotism to this heroic world peopled with kings and queens of great beauty. Filled with the beauties of this world, once a reality, the minds of these writers dwell in sadness at the altered destiny of the race.

Douglas Hyde

Douglas Hyde, who had devoted his life to the Gaelic

language and literature, pleaded for the "de-Anglicising of Ireland". He has been a vast propagandist for every thing Irish, in music, literature, games, customs etc. The "Literary History of Ireland" is his greatest contribution. Apart from being the first connected and full narrative of the literature of Ireland, it has proved to be a vast piece of propaganda. It is also a complete reply to the critics of the "language movement."

But from the point of view of pure literature, more importance will have to be attached to his collections of folk tales and Gaelic lore, his "Book of Folk Tales" (Leadhar Sgeuluigheachta) and the "Songs of Connacht". In these volumes will be found what has come to be regarded as the chief discovery and the most notable characteristic of the literature of the Revival—the effective employment of the Anglo-Irish idiom.

Casting aside the hesitations which restricted his English rendering of the "Beside the Fire", Hyde translated the "Songs of Connacht", not into formal English, but in the language nearest to the form and spirit of the original—the English of country people in whose language the Gaelic influence predominates.

It was the discovery of a new medium of great strength, beauty and flexibility, the full use of which was to be made later by J. M. Synge. Here is an extract:

"It is your melodious wordy little mouth that has increased my pain, and a quiet sleep I cannot get until I shall die alas!"

Songs of Connacht

The extravagant and amorous speeches of the "Play Boy of the Western World" are obviously contained in their essence in Hyde's translations.

"If you were to see the sky-woman and she prepared and dressed

Of a fine sunny day in the street, and she walking,
 And a light kindled out of her shining bosom
 That would give sight to the man without an eye"

This passage is from the "Songs of Raftery" and not
 "Play Boy"

A Change in Note

It is a pity that during the first half of the last century the energies of Ireland were occupied by political struggle. But in time the Young Ireland Movement was succeeded by the Fenians whose journal, the "Irish People" became, like the "Nation", a centre of literary activity. It has a special point of interest in the Revival, for here, instead of the vindictiveness of the "National School", is noticeable a sad idyllic note which suggests a transition to the manner of contemporary poetry. The co-operation of nationalism and literature outside of literature resulted in the Renaissance, known as the Irish Literary Revival.

Literary Societies

The creation in 1892 of the Irish National Society in London and the Irish National Literary Society in Dublin marked a definite crystallisation of this movement of cohesion.

The first steps were taken in London when the "Southwark Literary Club" was founded in 1883. From political contentionism, the club became more directly preoccupied with literature. Lectures were delivered on Irish subjects and efforts were made to stimulate the interest of Irish readers. A corresponding group was formed in Dublin. In 1888 the "Pan-Celtic Society" was created. Since both the groups were actuated with the same literary motives, co-operation between London and Dublin was rendered possible as well as an interchange of ideas. In London the "Southwark Club" was attracting writers like W. B. Yeats, Katherine Tynan,

Todhunter, Douglas Hyde and others. In 1891 a meeting was held at the house of Yeats and a scheme was discussed to transform the club into a more efficient medium for the cultivation and spread of Irish literature.

The following year the "Irish Literary Society" and the "Irish National Literary Society" came into existence in London and Dublin. Stopford Brooke, Alice Milligan, Katherine Tynan and Todhunter were among the members. The Dublin Society attracted Sigerson, Hyde, O'Grady and William Larmine.

A Declaration of Faith

Stopford Brooke, in inaugurating the London Society, while speaking on the "Need of getting Irish Literature into the English Tongue", pointed out that the use of English need not hamper them in their expression of the Celtic spirit or necessarily interfere with the continuation of the Gaelic traditions. In order, however, that this might be so, it was imperative that Anglo-Irish writers should work upon the material bequeathed to them by their Gaelic ancestors. He defined the most essential tasks: The translation of Gaelic texts, the moulding of the various historical cycles into an imaginative unity after the fashion of Malory, the treatment in verse of isolated episodes and tales of the heroic world and of the supernatural, and finally the collection of folk stories. This was as complete a manifesto of the principles of the revival as could be possible. To this address may be added Hyde's "Necessity of de-Anglicising the Irish Nation" and Lionel Johnson's poetry, "Nationalism and Patriotism."

Much could not be done owing to the conflict between the two groups; the one led by Yeats and consisting of younger writers, and the other led by Sir Charles Gavan Duffy, a remnant of the "Nation School" and the president of the Irish Literary Society. Yeats fought in the Irish press for his beliefs and

opposed political nationalism. Thus it was that many of the finest writers of Ireland were not assisted by either society and published their works outside the "New Irish Library" round which ranged a long and painful controversy.

New Phase

The work of the pioneers is now finished and the real movement with which we are concerned has set in. Allingham was the last of the scattered Irish poets who were trying to cultivate something of the national tradition. His death in 1889 coincided with the beginning of the new phase in the literary evolution of Ireland.

Political pressure had slackened with the collapse of the Parnell movement and an opportunity was afforded to the intellectual forces to make their appearance. A number of young poets published their first volumes : Katherine Tynan : "Louise de la Valliers" and "Shamrocks"; W. B. Yeats : "Mosada" and the "Wandering of Cosin"; and William Larminie : "Glanlua". These volumes had secured notice that would have been impossible earlier.

Groups were forming both in England and Ireland for the cultivation of literature, independent of politics. Up till now there had been two distinct groups of literature, those who had come together for the purpose of writing patriotic verse, and those who strove to renew the Celtic tradition. Co-operation between these two had hitherto been impossible. Now, with the calming down of political passions, a rapprochement between these two groups was sought after.

Mention has been made of the founding of the "Dublin University Review" which, under the editorship of T. W. Rolleston, published works of a distinguished kind by writers, including Yeats. "The Irish Monthly" also attracted great talent.

A Literary Event

But the most important literary event of the times was the publication in 1888 of the "Poems and Ballads of Young Ireland" in which were set forward for the first time the fruits of this new poetry. This slim volume was the first offering of the revival. With it were associated the names of Douglas Hyde, T. W. Rolleston, W. B. Yeats, Katherine Tynan, Rose Kavansgh and John Todhunter.

A majority of contributions show a singular sureness of grip and maturity of talent. Yeats' "King Goll" and the "Stolen Child," Todhunter's "Aghadoe" and the "Coffin Ship" possessed qualities of emotion and execution that have entitled them to rank with the best that has been created by the new poetry. The book is a harbinger of the new tradition. The efforts are patriotic no doubt, but not in the old sense. The poets substituted legends, fairy tales and the spiritism of the Irish countryside for political history and, in so doing, indicated the lines on which contemporary poetry has developed.

Todhunter, Katherine Tynan and Rolleston were among the contributors to this volume and it is to the credit of Todhunter that, despite his surroundings and upbringing, he should have understood and interpreted, in a small way, the new spirit when he could easily have remained indifferent to it like his friend Professor Dowdon.

Katherine Tynan

The work of Katherine Tynan, before the appearance of this "very much derived volume", as she termed it, was strongly tinged with pre-Raphaelitism. But under the stress of the new spirit, there was revealed in her a new innocent tenderness, something of a devotional sensitiveness to external beauty. An example is her "Answer". She combined in her poetry the ele-

ments of mystery with a certain type of chastened nationalism which gave her a quaint, though not exotic appeal. Though she occupied herself with Celtic themes and Ossianic lore, her religious feeling forced itself in poems like "Louise de la Valliere" and "Cuckoo Songs." In a way she is unique in that she is the only Irish poet in whom Catholicism has found literary expression.

Catholic Note

Mention has been made of the clash of paganism with Christianity earlier in connection with the explanation of "Celtic sadness". Irish poets have, almost as a body, ranged their sympathies with the paganism that symbolised Old Ireland, its romance and its history. It is remarkable how the Catholic writers have suppressed their religion from their work. The position is simply like this: one class has remained frankly pagan and, as a rule, mystic, while the other class has in no way been inspired by teachings to which it assents.

As mentioned above Katherine Tynan alone except a few minor poets, reflects in her work the attitude of Catholic Ireland. Catholicism had been a great force in the preservation, cultivation and perpetuation of arts and learning. But in Ireland it has been far from an aesthetic or fostering influence. So champions of Irish neo-Catholicism found little in it to base their enthusiasm upon.

In Katherine Tynan one would not find an expression of the profounder aspects of Catholicism; the exaltation and rapture of belief, for these belong to a more emotional and intellectual religion than that of the Irish Catholics. In Ireland the folk lore conception of Catholicism is more common. And Katherine Tynan describes their native faith; that complete self-surrender to the simple emotions of wonder and pity, which comprise the religious experience of the plain man.

Mention has already been made of the services of T. W.

Rolleston. Early death brought to a close the work of William Larmine, another and a promising member of the group. His verse, whatever little he wrote, was informed throughout with the spirit of Irish legend and mysticism.

BEFORE YEATS AND A. E.

The chronological method that has been a good ally till now, will have to be given up since we have arrived at the threshold of the movement, to trace whose origins we had to make this survey. Also we shall have to restrict general description as much as possible.

Our main purpose is to trace the various strains of metaphysical thought in the work of a group of writers who, through accident of birth, nationality or common aims, concentrated their activities in Dublin and were known by the name of "Dublin Mystics". We shall draw comparative inferences in the light of Hindu Philosophy. It is no forestalling of our conclusion to state that in this type of study we will not meet with much success except in the case of A. E.

Of course, in a comparative study there is no room to be dogmatic, though at every stage we shall find both false and true clues, the former in the case of W. B. Yeats. Differences of civilisation and culture present extreme difficulties in a study of this kind. This point has ceased to be of much importance in other cultural and intellectual walks of life, for with the ease of communications in modern times, ideas travel fast. But religion is a thing that grows from inwards and, as such, depends little on contemporary or transient phases of existence. Unless there is a unity of mind, thought and feelings, identity of spiritual conclusions is rare to find. Only in the case of A. E. do we come across a mind which accords with the Hindu conception of a seer, and in this respect, it need not surprise us if his whole method of thinking is akin to that of the Hindu sages of old. It may be said that spiritual ex-

perience derives its sap from the inmost being of man : it does not suffer any modification by the facts of civilisation. Wherever a kindred soul exists, reverie or inspiration is possible.

In Yeats, the method of inquiry is bound to be fitful, occasional and confusing; and the results often not very conclusive or reassuring. It is easy to classify consistent thought; but it is very often difficult, well nigh impossible, to separate charlatanism from genuine insight and spiritual experience. Yeats is always conscious of the self and, more often than not, playing with poetic conceits. The artist in him is at loggerheads with the mystic and in more cases than one the victory goes to the artist which is not very improper. Attempts at reverie often end in symbol and table turning.

Miss Mitchell in her "George Moore comes to Ireland" has a harsh though amusing caricature of Yeats which is substantially true. George Moore is speaking :

"I haven't tried potato cake or Irish stew as yet;
I have lived on eggs and bacon and striven to forget
A naughty past of ortolan and frothy omelette.

But W. B. was the boy for me, he of the dim wan clothes;
And—don't let on I said it—not above a bit of pose;
And they call his writing literature as every one knows.

If you like a stir, or want a stage, or would admired be,
Prepare with care a naughty past, then repent like me.
My past alas was blameless, but this the world won't see."

Still at times in Yeats' work one does come across strains of Hindu thought that have defied the professional conjurer in him. This is probably due to the survivor in him of the Celt who, as we have seen, did not much differ fundamentally from the early Aryan settlers in Hindustan.

Apart from some vague and undefinable ethnic kinship, the study of Theosophy was an important factor that brought together writers, now dubbed under the comfortable, though not very exact, name of "Dublin Mystics." It was a study of A. P. Sinnet's "Esoteric Buddhism" that led a band of young writers to Hindu philosophy; though Yeats' memories of Madame Blavatsky are far from edifying, or as he called her a sort of a female Dr. Johnson.

A point of considerable interest is that Johnston translated "From The Upanishads", but Johnston's trails are lost soon and an otherwise profitable line of inquiry nullified.

Dublin Mystics

The literary revival broke many traditions and renewed allegiance to many others. It was for the first time that a group of writers concentrated its activities in Dublin and not London. Formerly it was quite fashionable and proper for an Irish writer to seek the publication of his books in London and await approbation from the British reading public.

Towards the "eighties" of the last century, a number of writers drifted to Dublin as their intellectual metropolis. They were imbued with the same ideals and worked in collaboration with each other. A common factor of this group was the study of mysticism. These writers were W. B. Yeats, Charles Johnston, John Eglinton, Charles Weekes, A. E. (George Russell) and a number of other lesser names.

It is an irony of literary history that the name of Professor Dowden is associated with the Theosophical Movement in Dublin. Dowden was, for the greater portion of his life, rather hostile to the literature being created around him; but it was at his house that Yeats heard the discussion of A. P. Sinnet's "Esoteric Buddhism" and the "Occult World". This so aroused his interest that Yeats read the books himself and recommended them to his friend, Charles Weekes.

Yeats had further discussions with his friends and in 1885 the "Hermetic Society" was founded. T. W. Rolleston, Editor of the "Dublin University Review," helped them by publishing a series of articles by Johnston on "Esoteric Buddhism."

Johnston was so full of enthusiasm about this new subject that he went to London to have further talks with Sinnet and came back as a fellow of the Theosophical Society. Soon after he obtained recruits who later became members of the Dublin Lodge of the Society. The Lodge received its charter in 1897 and so the Hermetic Society, having no *raison d'être*, ceased to exist. Many years later the name was adopted by A. E. who formed the present Hermetic Society.

The Theosophical Movement provided an intellectual rallying ground for many a young Irish writer. Yeats was the first to make his works known in book form by publishing "Mosada". "Wanderings of Oisín" appeared two years later. The "Irish Theosophist" appeared in 1892. This monthly was devoted to the "universal brotherhood, the study of Eastern literature and Occult science". In 1898 its title was changed to "The Internationalist" an organ which in turn gave place to "The Internationalist Theosophist". John Eglinton, A. E. and Charles Johnston were the chief literary contributors of this magazine and they mostly wrote on the Theosophic Movement.

Charles Johnston translated "From The Upanishads" in 1896. A. E. wrote his "Homeward Songs : Songs by the Way". And John Eglinton contributed "Two Essays on the Remnant." Charles Weekes was the sponsor of these books.

Charles Johnston

Charles Johnston had to leave for India and therefore his contribution to the movement practically stops. His essays

in Theosophical literature have some bearing on the subject but he left Ireland so early that it was impossible for him to blend the Eastern and the Celtic elements so well as did A. E., and so his share in the ultimate success of the movement he started was not very intimate.

His "Ireland: Historic and Picturesque" published in the United States in 1902, has some passages that remind one of some of the eloquent splendours of O'Grady, but it is the only book of the kind he ever wrote.

Charles Weekes

Charles Weekes too did not leave much sign of his having participated in this phase of the Revival. In 1893 he published and immediately suppressed "Reflections and Refractions", the first book to appear by any one of the school. Despite their inevitable unevenness, the majority of the poems reveal a fairly high order of excellence. The dominant note is however intellectual rather than emotional. The transcendentalism of the mystic poet must be coloured with the vision of the artist if he would find acceptance. In Weekes the vision is absent though the intellectual heights reached are considerable. Naturally, therefore, Weekes selected such themes as required little emotion to lighten the burden of their thought. He could not attain that fusion of intellect with art which is essential for a poet; and his verse often leaves the reader cold by its frequent superficiality.

An exception however must be made in the case of "Louis Verger", an emotional piece of dramatic verse in which, with his usual intellectual insight, Weekes describes the sensations and analyses the feelings of an assassin. Here he succeeds in blending the emotional and intellectual qualities so essential for the appeal of a work of art.

A definite orientation towards Indian philosophy is noticeable in the poem entitled "That". In this Weekes reveals

the consciousness of a certain all-powerful presence, as the early Aryans did when they first came upon the plains of the Punjab and before they created their local utilitarian deities who were later raised to higher philosophical status as knowledge advanced and the early necessity disappeared.

But "That" does not merely reveal the primitive cry of the individual as he came in contact with the fierce moods of nature. It depicts the sad reflection that follows when the storm has passed. A certain note of inevitable Celtic loneliness creeps in at the end and this gives the poem its emotional poignancy.

What is that beyond thy life,
And beyond all life around,
Which when thy quick brain is still
Nods to thee from the stars ?
Lo! it says thou has found
Me, the lonely lonely one.

It may be a lower stage of philosophical conclusion that ascribes moods to the Supreme Presence, but the poem is a faithful register of the impulse to know and comprehend.

Weekes has another piece entitled "Think" to which the same comment applies, though the plane of thought is elementary and the conclusion rather commonplace.

Think the ragged turf-boy urges
O'er the dusty road his asses
Think on sea-shore far and lonely
Heron wings along the sand.

Think in woodland under oak boughs
Now the streaming sun-beam passes,
And bethink thee all are servants
To one all conquering will.

John Eglinton

John Eglinton was the subtle essayist of the Theosophical Movement. He with A. E. in poetry, completes the real contribution of philosophical thought and as such is entitled to a detailed examination. His first book, "The Essays on the Remnant", revealed the passionate impatience of a subjective youth at his first contact with the gross realities of life and ultimate disillusionment.

We are not concerned with the thesis of the idealist for a reconstruction of society or his remarkable characterisation of Wordsworth as "the first and greatest of the unemployed", or of Goethe who, "by reason of his propensity became indirectly the cause of the captivity of his brethren." What strikes us is the volume of emotion and brilliant expression of his revolt against the artificialities of life. John Eglinton wanted to revert to the simplicity inherent in nature "tremulous with leaves". "No genuine child of life", he said, was "but liable to sudden visitations from the wildness".

He played in prose the same role that Wordsworth did earlier for England in poetry. But this Wordsworthian mysticism or naturalism, which has remained a constant element in the work of John Eglinton, forms an interesting corollary to the mystic pantheism of A. E. The uncompromising individualism of John Eglinton is directed by him to a more exclusive expression of the promptings of the mystic faith.

In the first outpourings of his divine discontent, we see John Eglinton as "one who goes forth in the morning woods, in whose brain yet flaunt the pomp and processions of his dreams".

In 1902, in his "Pebbles From a Brook", John Eglinton gave expression to his best and most mature thoughts. The youthful flush of the earlier volume is gone and there is instead a more mature, detached and ironic, though serene,

pleasure in the examination of the philosophic ideals of his times.

Eglinton characterises civilisation as "like a robe whirled down the stream—out of reach in the eddies of London—a cloudy evaporated mass of problems—and the home sapient, poor, naked, neurotic, undeceived, ribless wretch. The young men exercise in the fields and the old men sit in council, and at sunset the daughters leap down the streets to dance."

Eglinton's fundamental attitude is : "Every man embodies in his own experience a fact which no omniscience can comprehend. Man is still the measure of all things". Such fierce individualism is hardly a suitable soil from where real self-annihilating wisdom can spring. But the protest is timely and justified.

Like A. E., Eglinton is a transcendentalist. Man once carried all the possibilities of his divine nature. He has fallen; but wisdom demands that he should take cognizance of this fact. But unlike A. E. he assumes the truth of his postulate instead of illustrating it from his spiritual experience.

Evolution, says Eglinton, knows nothing of exceptional temperaments. It knows only of householders and shareholders who ride the central flood of evolutionary tendency, and are carried along by soft gales of natural selection. This he says fails to account for the appearance, at the beginning of history, of the conception of religion.

Reverting to exceptional temperaments, he says that it is only from these that we get a religious certainty, without which "poetry cannot be criticised nor philosophic inquiry directed."

Avatars

This idea of exceptional temperament requires to be explored a bit.

The Hindu philosophy and religion recognise the periodical evolution and involution of life eternal, representing the systole and diastole of one universal heart which is ever at rest and

ever active. The whole world is a manifestation of God. All things, wheresoever they are, are vehicles for the manifestation of the Supreme Spirit. Sayana distinguishes these beings into different grades: "Amongst beings, those that breathe are high; amongst those, they have developed minds; amongst them, those that use knowledge; while the highest are those that are possessed by the sense of the unity of life in the Brahma". The one fundamental spirit reveals itself through those divergences of form.

The infinite in man is not satisfied with the transitory nature of the world that passes away. The troubles of man are due to the fact that he does not realise the God in him. Freedom is his, only if he can escape from the transient and finite in him. The more does one's life manifest the infinite in him, the higher he is in the scale of beings.

The most intense manifestations are called Avatars or the incarnation of God. These are not out of the way, miraculous beings, but only higher manifestations of the Supreme Principle. These exceptional temperaments differ from the lower order of creation in degree only. The Gita says that God moves and lives in all: He manifests Himself in a special degree in things that are splendid. The Rishis and the Buddhas, the prophets and the Messiahs, are intense revelations of the Universal Soul; exceptional temperaments in tune with the infinite. The Gita holds out the promise that they will appear whenever they are needed. When the downward materialistic tendency dominates life, a Rama or Krishna, a Buddha, or a Jesus comes upon the scene to restore the lost harmony of righteousness. In these men who break the trammels of sense, unfold the love of truth and virtue, and reveal to man the beauties of the higher life, we have exceptional intense concentrations of God. A Hindu is ready to offer homage and reverence to all helpers of humanity. He believes that God may be incarnated in any man, even as he was in Jesus or Buddha.

The divine manifestation is not an infringement of man's personality. On the contrary it is the highest possible degree of man's natural self-expression, since the true nature of man is divine. Thus we find that John Eglinton, in his vague and impulsive way, very closely approximates to the Hindu ideal. He says that the element wanting in modern experience will be found when our creative minds have realised that "it is not the function of genius to add new trophies to civilisation, but to disclose to men new depths within themselves."

The Hindu Idea

This, clothed as it is in the garb of extreme individualism, might sound baffling at first, but a slight analysis will show that John Eglinton's ideal is very close to the Hindu attitude towards the individual, his nature and mission. Man has to realise himself and find out the hidden depths of his soul. A conception of eternity is far from pleasant unless men realise the eternal in them. "The age of omniscience is the age of agnosticism". The scholar and the scientist cannot help us. The poet is asked for truth and is given "facts". Literature aspires to live for "art's sake", an attitude which Eglinton likens to the declaration of a "beauty past her prime", that "she will have nothing to do with men". This he calls a betrayal of our trust in literature for our men of letters and ideas have allowed themselves to be seduced from their own true heritage. "On the occasion of each heresy, the world sends out one of its representatives to be converted, and to hail the new prophet to dinner".

Despite one or two likenesses, the mysticism of Eglinton is not the mysticism of A. E. but of Wordsworth. The contemplation of nature to him is not the occasion for those visionary ecstasies that we find in the poet of "Earth Breath". It provokes the mood of philosophic meditation that we associate with the creator of the "Lyrical Ballads". Eglinton is essen-

tially a philosopher, not a seer or even a man of action like A. E. He reflects the reflective and passive side of the faith of which A. E. is the intuitive exponent. Though not essentially a poet, in Eglinton we find a deep intellectual emotion; the cries and protests of the mind as it broods over the mystery and tragedy of life.

The tragic little poem, rescued by Yeats and entitled "Names", deserves to be quoted in full on account of its volume of "intellectual" emotion and the longing cry of the soul for what is "behind the veil".

No temple crowned the shaggy capes
No safety soothed the kind,
The clouds unfabled shifted shapes,
And nameless roamed the wind.

The stars the circling lights of heaven,
The mountains bright with snows
Look down, and sadly man at even
Lay down and sad he rose.

Till ages brought the hour again,
When fell a windless morn,
And, child of agonistic pain
And bliss, the word was born.

Which grew from all it gazed upon,
And spread through soil and sphere,
And shrank the whole into the one,
And fetched the farthest here.

High is the summer night but deep
The hidden mind unfolds;
Within it does an image sleep
Of all that it beholds.

Alas, when with beady brow
His conquering name has set
To, planet, plant, and worm, who now
Will teach us to forget.

What poet now when wisdom fail,
Another theme shall dare.
The nameless, and remove the veil
Which hides it every where.

W. B. YEATS

A. E. who should naturally follow John Eglinton, will have to wait until we have done with a writer who, howsoever great, to us conveys little or nothing. The leader of a literary movement, the most versatile and gifted writer of his times and the creator of poetry of exquisite beauty, grace and rhythm, Yeats has little to surpass A. E. in the genuineness of emotion and purity of thought. We will enter into a comparison of the two poets when we deal with A. E. At present an account of the work of William Butler Yeats and an examination of his claim to mysticism will suffice.

Yeats contributed four pieces to the "Poems and Ballads of Young Ireland". His "Madness Of King Goll" and "The Stolen Child", two of his finest poems, indicated to a certain extent the lines of his future work. These poems reveal a certain sureness of grip and maturity of craftsmanship; a singular, if a mysterious, sense of reality so peculiar to Yeats' later poetry. The theme is of course legend and fairy lore.

In the "Legend of King Goll" for instance, Yeats succeeds to a remarkable degree in reconstructing the spirit of Celtic mysticism. The King is old, and the King has lost his mental faculties through misfortunes and reverses. In his madness he hears voices of supernatural beings, waking or asleep. In the cry of the wind and the rolling of the waters, he hears the

tramp of the marching feet of creatures of another world, and the breath of elemental powers. In one refrain, Yeats catches all the spirit of lonely madness and the mystery of nature as sensed by the Celt:

They will not hush, the leaves aflutter round me

The beach leaves old.

Yeats's "Mosada" and the "Island of Statues" were also the efforts of a young man who had not realised his true heritage and future line of work. He says: "When I first wrote I went here and there for my subjects as my reading led me and preferred to all other countries the Arcadia and India of Romance".

Neither the medieval Spain of "Mosada" nor the Arcady of the "Island of Statues" gave Yeats the setting and atmosphere best suited to his genius. He still spoke of the dominance of Spenser and Shelley and complained of his verses being too full of the "reds and yellows" of Shelley, gathered in Italy. He says: "And I had read Shelley and Spenser and had tried to blend their styles together in a pastoral which I have not come to dislike very much." He was probably referring to the "Island of Statues". But even in these, the voice of Ireland could be heard aloud:

Thou shalt outlive thine amorous happy time,
And dead as are the lovers of old rime
Shall be the hunter-lovers of thy youth
Yet evermore through all thy days of Ruth
Shall grow thy beauty and dreamless truth.

Such lines bear the imprint of the stuff out of which Yeats is fashioned.

"The Wanderings of Oisín" too is not a point of departure as is often maintained. It had its source in Standish O'Grady. Also William Larmine's "Glanua" and Todhunter's "Banshee" were published at the same time. But there is no

denying the fact that this was the beginning of Yeats as we know him.

Though there are no direct traces, it is certain that the "Wanderings of Oisín" owes its existence to Ferguson's earlier work. Yeats was ever a champion of Ferguson against the rhetorical school. In 1886 he wrote in the Dublin University Magazine, urging the merits of Ferguson, whom he called the precursor of the new spirit. Through Ferguson and Allingham he realised what Irish poetry should be once the political note was softened or silenced. He wrote :

"If somebody could make a style which would not be an English style and yet would be musical enough and full of colour many others would catch fire from him". Yeats did it. With his exquisite artistry in words, he had a great advantage over Ferguson who in craftsmanship falls short of his lofty conceptions.

The "Wanderings of Oisín" starts with the fundamental clash between Paganism and Christianity to which a reference has already been made. Out of this clash Yeats created something which was truly in harmony with the Celtic spirit, as well as an expression of his inmost self. Oisín departs for the magic fairyland with Numah with whom he lives for hundreds of years, first in the Island of Dancing and of Mirth, and then in the Islands of Forgetfulness and Victory.

"The Countess Kathleen and Various Legends and Lyrics" in 1892 reveals a more exclusive preoccupation with Celtic Ireland. Yeats voices his conviction in the familiar apologia:

"Nor may I less be counted one
With Davis, Mangan, Ferguson,
Because to him who ponders well
My rhymes more than their rhyming tell."

Yeats was fighting at this time against the "Davis School." He was a member of the Young Ireland Society and like them

wanted to write popular poetry. The result was the production of many successful ballads written after direct contact with the people, e.g., "Father O'Hart", and "The Lamentations of an Old Fisherman."

Distinct from pieces inspired by country lore, are poems which have their root in the heroic cycles: "Fergus and the Druid" or "The Death of Cuchulain". They are fragments but in them are found moments of Yeats' happiest expression, for instance:

"A wild and foolish labourer is a King
To do and do and never dream."

This is Yeats own formula of life.

Alleged Mysticism

The period between 1892 and 1899 was one of silence and thought for Yeats. In 1899 Yeats published his most serious and "mystical" book of lyrics: a slender volume, entitled "The Wind Among the Reeds." This book was written after the recent study of William Blake, when Yeats was engaged in those mystic speculations of which "The Secret Rose" and "The Tables of the Law" were earlier expressions in prose.

The movement in the direction of mysticism began to define itself when Yeats gave to a number of poems from the "Countess Kathleen" the sub-title, "The Rose" on the occasion of their republication in 1895. These poems were written under the growing influence of mysticism that was separating Yeats from the poets of the younger generation. He wrote in 1892:

"Know I would accounted be
True brother of that company
Who sang to sweeten Ireland's wrong
Ballad and story, ramn and song.

geon reads in every page of Yeats is unfortunately a very rare phenomenon as we will see.

The Rose Motive

The "red rose-bordered hem" is the leit motif of Yeats' thought at this time. It emerges more definitely in "rose", is emphasised in the "Secret Rose" and "Rosa Alchemia" and culminates in the "Wind Among the Reeds." Eternal beauty, which is the poet's quest, is symbolised in the "Rose" which is the title of the 1895 poems. These are to Yeats the pathway leading to the direction of his ideal.

"The Wind Among the Reeds" is the most perfect expression of Yeats. The germs of the book were noticeable in the "Two Trees". An external proof of this claim advanced on behalf of this book is in the fact that it remains absolutely unaltered to-day: Yeats is the most fastidious of writers and his mania for revision knows no bounds. Perhaps it is due to the fact that he knows that he is not always true to himself. The alleged pose that he has chosen to assume, must be demanding occasional and liberal fortifications and repairs. However one point has to be admitted: every revision is for the better.

Before the book under consideration, Yeats had written a biography of Blake and two other books in prose: "The Secret Rose" and "The Celtic Twilight." Thus it was that the book marks the full maturity of Yeats' technique and mystical predilections. Predilection might be a harsh word to use but it is doubtful if, with all the paraphernalia of mysticism, the book is an authentic voice of the mystic. For above all mysticism is intellectual. It has nothing to do with art or sensuous experience. The "perfect lifting of an arm" has no appeal for the mystic. The vision cannot be qualified with objective perception. It comes as the reward of severe mental discipline, after rigorous study and "tapisya".

In Yeats' poetry and thought there is no vestige of intellectualism. Mysticism to him is an artistic refuge, yet another source of poetic conceits and fresh turns of phrases. He has mastered the science of verse not reverie. This is why his vision does not convince us: it is literary not spiritual. The concepts which are realities in A. E. or Blake are in him symbols, reminding one of an ancient pagan faith, beautiful but ineffective.

Yeats continued the manner of "Wind Among the Reeds" in the "Seven Woods" (1909), "The Green Hamlet" (1910), and "Responsibilities" (1914). But

"The fascination of what is difficult
Has dried the sap out of my vein;"

and this is perfectly true so far as he and his work is concerned. He tried to bring down God to decorate his studio and failed ignominiously. Symbolism in his case turned out to be a bad task master and at one period it vanquished the poet in him.

But in Yeats' later poetry is noticeable a certain rugged maturity of thought and expression which he had not the time or inclination to cultivate during his hot youth. The period of experiments is over and Yeats to-day reveals a classic grandeur that pleases by its purity of feeling and chiselled beauty of expression.

In his lyrics written between 1904-1919 and in the "Selected poems" there abound such jewels as "When Helen Lived".

We have cried in our despair
That men desert,
For some trivial affair
Or noisy insolent sport,
Beauty that we have won
From bitterest hours;

Yet we, had we talked within
Those topless towers
Where Helen walked with her boy,
Had given but as the rest
Of the men and women of Troy,
A word and a jest—

No Second Troy
Why should I blame her that she filled my days
With misery, or that she would of late
Have thought to ignorant men most violent ways,
Or hurled the little streets upon the great,
Had they but courage equal to desire?

What could have made her peaceful with a mind
That nobleness made simple as a fire
With beauty like a tightened bow, a kind
That is not natural in an age like this,
Being high and solitary and most stern?
What could she have done being what she is?
Were there another Troy for her to burn?

Yeats' Prose

Before entering into a detailed examination of Yeats' philosophical tenets, a survey of his prose and dramatic writings too is necessary. In them will be found much mysticism, little philosophy and less original thought. Mysticism there will be but mysticism as the Celts understood it—tales of fairies and of supernatural beings, of magic and strange happenings, the bartering of the soul or excursions into the land of the dead or the more alive.

In a series of essays entitled "Ideas of Good and Evil" Yeats throws much light on his intimate beliefs. In 1893 he published a collection of short stories whose title provided publicists a phrase that still "belabours" the author of "Celtic

Twilight". This book in which Yeats elucidates his attitude and the attitude of the Irish people towards the spirit world and the supernatural, comprises of short stories, collected by him in his wanderings in his youth in the countryside of Sligo and Galway and, as such, it is a compendium of Celtic folklore still alive in the memories of men.

In a series of sketches, Yeats illustrates how intimate is the relation between the visible and the invisible world in the mind of the peasantry who have preserved intact the faculty of belief and vision. But not all are like the men of whom we are told the complaint:

"If I pass the Hill of Dunboy, Old Captain Burney may look out for me. If I go round by the water and up by the steps, there is the headless one and another on the quays and a new one under the Churchyard wall. If I go round the other way, Mrs. Stewart is appearing at the Hillside Gate and the very Devil is in the Hospital Lane"

But the stories of Yeats mainly depict a friendly state of relations with the supernatural world. The fairies that haunt the countryside are not objects of fear: they are an intimate part of the life of the dwellers therein. They occasionally come out and ask for a favour or render one.

Yeats is so impressed with this pleasant intercourse with the spirit world that he is constrained to write "A Remonstrance with the Scotchmen for having soured the Disposition of their Fairies". This is a charming piece of humour in which the two attitudes are amusingly contrasted.

"You have discovered the fairies to be pagan and wicked: you would have them up before the magistrate," he protests. "In Ireland warlike mortals have gone amongst them in their battles, and they in their turn have taught them great skill with herbs. . . . In Scotland you have denounced them from the pulpit. In Ireland they have been permitted by the priests

to consult them on the state of their souls”.

“The Celtic Twilight” is just an elaboration of this happy state of relations between the two worlds. The natural and the supernatural, Christianity and Paganism are so closely allied that we “exchange civilities with the world beyond.” It is just this exchange of civilities that has moulded the sensitive imagination and the belief of the Irishman.

The Eternal Moment

In 1897 Yeats published the “Secret Rose” and “The Tables of the Law”. Both the books comprised of a collection of short stories that foreshadowed the “Wind Among the Reeds”.

“The Secret Rose” embodies Yeats’ complete expression towards the spirit world. The theme and motive are the same as in “The Celtic Twilight”. He attempts to portray a visionary Ireland with the aid of fairy lore and legend woven together into a delicate imaginative fabric. There is however a difference: “The Secret Rose” shows a strong tinge of the doctrines of the intellectual mystics. The commentator of Blake and disciple of Sar’ Peladin is now in evidence. The naive and artless stories of the earlier book are transformed by a mind that has brooded over the works of Boehme and Swedenborg.

“The Tables of the Law” are merely “Tales of Imagination and Mystery”. The atmosphere of the supernatural and the paraphernalia of alchemy and occultism combine to give an impression of mystery and reality which appeals to the readers. In these narratives, drawn from Irish Legend, Yeats utilises the knowledge of mystic teachings and Cabalistic formulae, gleaned from many sources.

Mysticism Examined

It is not until the mysticism of the book is examined from an intellectual point of view that one realises how fundamentally literary it is. What was said of the “Wind Among the

Reeds" is fundamentally true of the "Secret Rose"—the mysticism is decorative or at the most symbolic, not doctrinaire. Yeats, it seems, has heard of the mystic messages of Blake and Boehme, but he is unable to correlate them into an intelligible, definite and systematic body of belief.

Yeats being above all an artist finds a personal satisfaction in a certain wavering and nebulous theosophy, but his utterances hardly furnish any substantial material to the uninitiated. "The Red Hanrahan's Vision," in which the lovers had heart-shaped mirrors instead of hearts, is a conceit, not a vision. An allusion like this one in "Rose Alchemia" to beings, "each wrapped in the eternal moment, in the perfect lifting of an arm, in a little circlet of rhythmical words", reveals a weakness which is fundamental. "The Eternal Moment" does not come to the mystic in another's conception of him and "the perfect lifting of an arm" has no other sense but that it is a purely external idea of perfection as seen by another. Mysticism teaches that the eternal moment is one of self-realisation: it is subjective, not objective. The highest moment of a man's life is fixed by himself and cannot be a beautiful gesture which is felt or seen to be such by an onlooker.

These facts emphasise two aspects of Yeats' mysticism: symbolism and ornament. Whatever mysticism he has is therefore in his fairy beliefs and not in the borrowed and badly digested doctrines of the great mystics.

Ideas of Good and Evil

Yeats published in 1903 his "Ideas of Good and Evil"; in 1907, "Discoveries"; in 1908, "Poetry and Ireland" and in 1911, "J. M. Synge and the Ireland Of His Time". All these were incorporated into one volume: "The Cutting of an Agate".

On these rests Yeats' fame as an essayist. Opinions differ regarding their literary merits: some pronounce the essays as stilted and precious, while others, the clearest and most flexible

prose Yeats ever wrote. But the change that became apparent when Yeats wrote "The Secret Rose" and which became more pronounced in "The Wind Among the Reeds" is a permanent condition of the "Ideas of Good and Evil". Thus those who complain of obscurities only denounce the ideas of Yeats. Once it is realised that the mysticism that Yeats teaches is an attempt to explain theoretically an artistic instinct, the charge of artificiality loses its point.

In the essays whenever Yeats deals with literature, he is always clear and readable; but when he reverts to his so called mysticism confusion and obscurity are bound to follow.

In "The Tree of Life" a passage occurs which puts in brief all that has been repeatedly said about Yeats' work. Yeats says that a poet sets out to put into his poetry "his very self", by which he means a representation of his own visions. But instead of realising himself, Yeats confesses that he has come to care for "nothing but impersonal beauty", because "as I imagined the visions outside myself, my imagination became full of decorative landscape and still life."

But as in his verse, Yeats' prose leaves an impression of great beauty and artistry in word technique. Had he devoted the same concentration to a study of mysticism as to the creation of a style, his poetry would have claimed a greater attention on account of its content.

Philosophic Belief

The philosophy in both Yeats' poetry and prose is vague and nebulous. He started from a belief in the great mind and memory of nature of which our minds and imaginations are a part. Imagination he conceived of as the link between the Immortal Memory and the memory of man; and symbolism as the instrument by which to awaken the correspondence between the two.

Here we see the ludicrous culmination of an idea, started

intrinsically on a very noble strain. The way to attune oneself to the eternal mind is not symbolism or cheap magic: at least not according to the Hindus. Ritual and chant might help in creating proper atmosphere for the lesser seekers after God, but the real way to achieve true godhead is far from mechanical. It is a life process, involving a surrender of self, accompanied by severe discipline and giving up of the world and the inevitable life of the senses.

But Yeats must justify the elaborate symbols he uses by recounting the moods they engender in him, enabling him to enter into communion with the spirit—or is it spirits—of the world beyond. This “communication with the spirits beyond” under no garb of literary beauty can be confused with the true communion of the mystic with the all pervading consciousness of the supreme being.

The test of a truth or an experience is its verification. Under proper circumstances a similar string of emotions or feelings should be capable of reproduction in the third party. Yeats’ symbols leave the reader cold or astounded. He remains singularly unperturbed despite their formidable properties. Yeats has, on several occasions, described with suspicious authenticity and precision, the effect of these symbols; but the very wealth of detail makes one doubt their genuineness. For reverie belongs to a dream world where things move in a misty haze or in a light incapable of being described in detail: at least not in a language that is used for describing things that belong to a lower plane of existence.

Spiritual experience, according to the Hindus, mounts from the lower to the higher, and as it rises, drops all human or worldly appurtenances stage by stage; sense, sound, light or intellectual perception all drop off in turn as the visionary reaches the ultimate state of “Samadhi”. Nobody has described this experience: nobody can. It is a reward that comes once in several lifetimes and that too after much discipline and practice

and continence.

When Yeats says that he can achieve all this by merely drawing with a piece of chalk the appropriate symbol, then comment is useless. The doctrine of inertia, or shrinking from the problems of daily life, is a very common experience of every weak human being and it does not fit into the mystic philosophy. The practical strength of mysticism is never compatible with the popular view fostered by writers among whom Yeats is one.

Reference has been made to the classic beauty of the later poetry of Yeats. His prose too has similarly reached a state of pleasing perfection in his later years. The charm of his "Reveries over Childhood and Youth" and "Four Years After" is great and is not contained only in the simplicity of style but in a happy return to origins. The confusing obscurity of after-day vanities has given place to an honest account of his life and feelings which make his autobiography a delight to read. Here is a piece from his later poetry which needs no comment and with it we can suitably conclude the topic:

"I am worn out with dreams;
A weather worn, marble Triton,
Among the streams;
All day I look
Upon this lady's beauty
As though I had found in a book
A pictured beauty,
Pleased to have filled the eyes
Or the discerning years,
Delighted to be but wise,
For men improve with years."

Dramatic Works

Yeats' genius is essentially poetic, not dramatic. Play-

writing came to him as part of propaganda. The creation of a National Theatre led him into stupendous labours. But the plays written by him, though rich in sensuous beauty and the charm of words and phrases, do not offer those tense emotional or actional moments on which their stage success depends. The theme for instance of "Countess Kathaleen," the story of the sacrifice of her soul by the Countess, lest others should traffic in theirs, is essentially one for the dramatist. It however eludes Yeats who succeeds instead in creating a "poem" of considerable beauty and appeal.

When Yeats amended, as was his wont, certain lines in this play and gave to the world the now famous lines :

The years like great black oxen tread the world !

And God the herdsman goads them on behind

And I am broken by their passing feet,

he was saying something that far transcended mere artistic dilettantism. Here was the poignant cry of a soul that could not help express itself in lyric verse. Out of an external need and not impelled by his own true genius, he entered into a work which had great value as national propaganda, or even as poetry, but none as drama. Another result was that he entered into an unfortunate controversy which was very bitter and led to much mud-slinging and dragging in of personalities.

Yeats' dramatic activity coincided with the publication of the "Wind Among The Reeds" in 1899 when he was engaged in the creation of a national theatre. The "Countess Kathaleen" was written in 1892, seven years before the founding of the Theatre. The "Land of Heart's Desire" was produced in London in 1894. These two plays illustrate the note of Paganism and Celtic lore in Yeats and his peculiar, and almost uncanny skill in handling fairy theme. Another play of Yeats that has achieved great popularity is "Cathleen ni Houlihan," a folk drama with a strain of patriotism, it is based only on an improvised fairy theme. And

no true Irishman can fail to be thrilled by the appeal of the "poor old woman" whose voice drew away Michael from his hearth and bride-to-be, to fight for his country in the days "when the French were on the sea" and their hopes very high. "The Hour Glass" is a morality based on Irish folk-lore. It has some interest inasmuch as the theme concerns a "wise man" who would not admit the remnant of faith that would save him from eternal damnation. The wise man dies in ignorance of his destiny in the first version of the play, but on revision Yeats shows him as accepting the Eternal Will and dying fully convinced of an ordered destiny.

The "Shadowy Waters," which appeared in 1900, was the first of the mythological series. But its beauty is so essentially poetic that its qualities as a play for the stage are naturally forgotten. The elusive mystery of its atmosphere and the delicacy of expression remind one of the "Wanderings of Osin." Years of fond dwelling on the play (revision, annotation and alteration) have made it the truest expression of Yeats. It is naturally a reflection of the poet's most intimate thoughts. It has so often been dreamed and re-dreamed that Forgal's lyric cry—

"Could we but wholly give us to the dreams,
And get into their world that to the sense
Is shadow, and not linger wretchedly
Amongst substantial things,"—

is echoed and re-echoed in the pages of his books.

The Nob Tradition

Though Yeats' sense of dramatic fitness grew as he wrote play after play, Lionel Johnson's criticism is fairly justified: "Yeats wrote for the stage to hear his own verse spoken." This statement ignores the personal, not temperamental attachment of Yeats to the dramatic movement. Never the less it is substantially true that the dominant motive of Yeats was the

artistic perfection of the language. It is the music of the word and the setting that interest him.

Yeats has detailed his experiments in the spoken word at the Dublin Theatre in his autobiography. As the founder of the Anglo-Irish Noh play, Yeats declares that he has at last found a solution of the problem presented to the poet-dramatist by the modern stage. He writes :

"My blunder has been that I did not discover in my youth that my theatre must be the ancient theatre, made by unrolling a carpet or marking out a place with a stick or setting a screen against a wall. Certainly those who care for my kind of poetry must be numerous enough if I can bring them together, to pay half a dozen players who can bring all their properties in a cab and perform in their leisure."

Commenting on this, Ernest Boyd writes :

"While we may welcome any theory which seems to provide him with necessary stimulus to write poetic plays, it is clear that drama cannot be restored to dignity by a negation of the material framework of its existence. Theatre reformers move towards a species of dramatic nirvana; eliminating scenery, actor, audience. When there are no playgoers to be bored by impossible plays, no dramatists to be subordinated to scenic efforts and no actors to interfere, then we shall witness the euthanasia of the Higher Drama."

Conception of Literature

In his "Plays and Controversies" Yeats says that we will have to find and write plays that will make the theatre a place for intellectual excitement—if we are to do this we must learn that beauty and truth are always justified in themselves, and their creation is a greater service to our country than the writing that shows a compromise in the seeming service of a cause. He does not care whether a play is moral or immoral for,

he says, he has been always of Verhaeren's opinion that a masterpiece is of the very conscience of mankind.

Literature to him is the greatest teaching power of the world, the ultimate creator of all values ; and it is thus, not only in the sacred books whose power everybody knows and acknowledges, but in every movement of imagination in song, story, or drama that the height of intensity or sincerity of emotion is reached. Literature must take the responsibility of its power, and keep all its freedom : it must be like the wind that blows where it listeth. It must claim its right to pierce through every crevice of human nature, and to describe the relation of the soul and the heart to the facts of life and of law, and to describe the relation as it is and not as we would have it and in so far as it fails to give us that foundation of understanding and sympathy and charity, for whose lack our moral sense can be but cruelty, it fails in its mission. It must be as capable of not telling a lie as nature, and it must say before all virtues, "the greatest of these is charity."

Developing his ideas, Yeats proceeds : A feeling for the form of life, for the graciousness of life, for the infinity of life, for all that can be written in codes, has always been greatest among the gifts of the literature of mankind.

"Indeed the Muses being women," says Yeats, "all literature is but their love cries to the manhood of the world—it is now one now another that cries, but the words are always the same. 'Love of my heart, what matter to me that you have been quarrelsome in your cups, and have given your love here and there ? It was because of the whiteness of your flesh and the mastery in your hands, that I give you my love, when all life came to me in your coming'.....And then in a low voice that none may hear—'Alas, I am greatly afraid that the more they cry against you the more I love you.' "

Yeats finds two kinds of poetry commingled in all the greatest works. When the tide of life sinks low, there are pic-

tures as in the "Ode to a Grecian Urn" and in Virgil at the plucking of the Golden Bow. The picture makes us sorrowful. We share the poet's separation from what he describes. It is life in the mirror, and our desire for it is as the desire of the lost souls of God; but when Lucifer stands among his friends, when Villon sings his dead ladies a song in so gallant a rhythm, when Timon makes his epitaph, we feel no sorrow, for our life itself has made one of its eternal gestures, has called up in our hearts its energy that is eternal delight. All art he holds is founded upon personal vision and the greater the art the more surprising the vision.

The Symbol Explained

Already a detailed examination of the legitimacy of Yeats' symbolism has been made. But it will not be out of place to explain and illustrate this symbolism.

We have concluded a survey of Yeats' contribution in three branches of literature and also examined the claims advanced for his thought and philosophy. We have seen how his mysticism is the result of the impact of Paganism of the Celts on a sensitive mind, actuated by a love for the country and its past glory. The symbolism that Yeats developed was the result of a compromise between this love for ancient Ireland and the artistic susceptibilities of a poet of modern times well versed in both the lores. It was a justification as well as a safety valve for the artistic impulse which could not be smothered in an acquired interest in a subject alien to the essential genius of the poet.

Yeats has himself much to say on this symbolism through which he made truce between art and philosophy. He writes in his autobiography that he, and a friend of his used to read together the works of Baron Reichenbach on the Odic force and also the manuals published by the Theosophical Society. Yeats read papers on these and kindred subjects in the Hermetic

Society on several occasions. When they first founded the Hermetic Society, Yeats says, he proposed for their consideration that whatever the great poets had affirmed in their finest moments was the nearest they could come to an authorised religion, and that their mythology, their spirits of water and wind were literal truth.

"I had," writes Yeats, "read 'Prometheus Unbound' with this thought in mind. Sometimes a professor of oriental languages at Trinity College came to our Society and talked of the magicians of the East... And we persuaded a Brahmin to come from London and stay for a few days with the only one of us who had rooms of his own.

"It was my first meeting with a philosophy that confirmed my vague speculations and seemed at once logical and boundless. Consciousness, he taught, does not merely spread out its surface but has in vision and in contemplation another motion and can change in height and depth."

This first contact, it is a pity, did not prove deep enough or productive of lasting good. Yeats believes that the mind is known in certain conditions of trance, to attain a "quickness so extraordinary that we are compelled at times to imagine a condition of unendurable intellectual activity from which we are saved by the merciful stupidity of the body." Any Hindu philosopher will disillusion Yeats about this state of unendurable intellectual activity in the state of trance.

"Proud and Lovely Things"

Describing his belief and experience, Yeats says: "I have described what image—always opposite to the natural self or the natural world—Wilde, Henley, Morris, copied or tried to copy, but I have not said what image I found for myself. It is perhaps because nature has made me a gregarious man, going hither and thither for conversation and ready to deny from fear or favour his dearest conviction, that I love proud and lonely

things... In later years my mind gave itself to gregarious Shelley's dream of a young man, his hair blanched with sorrow, studying philosophy in some lonely tower, or of his old man, master of all human knowledge, hidden from human sight in some shell-strewn cavern on the Mediterranean shore."

This dream unfortunately has persisted too long in Yeats' case and has been responsible for much biting satire and more harmful criticism. Already in Dublin he had been attracted to the Theosophists because they had affirmed some of his beliefs.

Meeting Madame Blavatsky

Yeats says that he heard that Madame Blavatsky had arrived from France or from India and he thought that it was time he looked the matter up; for certainly, he writes, "if wisdom existed anywhere in the world, it must be in some lonely mind, admitting no duty to us, communing with God only, conceding nothing from fear or favour." He undertook a pilgrimage to the little house in Norwood.

When he was admitted he found an "old woman in a plain loose dress: sort of old Irish peasant woman with an air of humour and audacious power. A great passionate creature, a sort of female Dr. Johnson." He had discussions with her on symbolism, thought transmission and mediumship.

Yeats relates the story of a Japanese painter whose horses from the temple walls had slipped down after dark and trampled the neighbours' fields of rice. Some one in the morning had looked up and found the painted horses still with dew and "trembling into stillness."

Mathers was the name of an associate of Yeats in those days of cabalistic practices. Yeats soon mastered Mathers' symbolic system and says that he discovered that for a considerable minority, "the visible world would completely vanish and the world summoned by the symbol take its place."

Yeats recounts how he felt a smell in a railway carriage that he had smelled at M. B. V's place. He gives analogies between smell and image and then between the sense of touch. He discovered that he met a man who had fought a cat in his dreams and awoke to find his breast covered with scratches. To Yeats this was a phenomena induced by symbol, though modern psychologists have other and more scientific explanations to offer.

Exciting a Cat

Yeats has much to say regarding his mystic belief and the existence of the world of the fairy and of the symbol. But this does not preclude him from making fun of others who may be enunciating his own belief. This note is unfortunately called by his critics as one of self-importance.

He tells of a queer old character whom he met in the Hermetic Society and who claimed to have dabbled in alchemy. The house of this old man soon became a romantic place for a little group. One Florence Farr, who too had been initiated, says Yeats, brought a tale of Marvel. Mathers had taken her out for a walk through a field of sheep and said: "Look at the sheep. I am going to imagine that I am ram" and at once all the sheep ran after him. He, on another occasion gave her a piece of cardboard on which was a coloured geometrical symbol and told her to hold it to her forehead; and she found herself walking over a cliff above the sea.

Yeats' comment is: "I did not think the ram story impossible, and even tried to excite a cat by imagining a mouse in front of her nose."

A. E.

Yeats writes in his autobiography: "At the top of the house lived Mr. George Russell...(He) was in the eyes of the community a saint and genius...We never derided him or told

tales to his discredit. He stood outside the sense of comedy.

"His friend, John Eglinton has called him the 'Social cement' of our civilisation; and we would 'gush' when we spoke of him, as men do when they praise something incomprehensible.

"But when he painted there was no difficulty in comprehending him. How could that ease and rapidity of composition, so far beyond anything that we could attain to, belong to a man whose words often seemed without meaning?

"At the time I write of him, he was a religious teacher and that alone—his painting, his poetry, his conversation, all subservient to that end. Men watched him with awe and bewilderment; it was known that he saw visions continuously, perhaps more than any modern man since Swedenborg; and when he painted or drew in pastel what he had seen, some accepted the record without hesitation, others like me...divined a subjective element, but no one doubted his word.

"One might not think him a good observer, but no one doubted that he reported with scrupulous care what he believed himself to have seen; nor did he lack occasional objective corroboration. He dreamed of a church at a spot. On digging there were its foundations. A woman said to him that she was unhappy: "you will be perfectly happy at seven o'clock," said he. I asked him about it and he said that it suddenly came upon him to use these words".

This might be quoting at too great a length to start a study with but we must have a proper idea of the personality of A. E. before we can understand or interpret his ideas and thought. And no more reliable evidence can be found than in the estimate of a contemporary and to a certain extent a colleague.

A. E. in thought, upbringing and spirit is the complete embodiment of the Hindu idea of a seer or Rishi. And therefore it is no wonder that much of his thought accords with

the philosophy expounded in our books. Spiritual belief and experience are introspective: they have their origin in the soul or the spirit. They do not depend upon external circumstances or accidents of civilisation but to the extent to which a person is in tune with the wider life which is the life of the spirit.

Yeats writes: "When Russell and I had been at the art school, six or seven years before, he had been almost unintelligible. He had seemed incapable of coherent thought. Men watched him with awe and bewilderment, it was known that he saw visions continually...Nor did it fail to make him a bad literary critic, demanding plays and poems where the characters must attain a stature of seven feet...I sometimes wonder what he would have been, had he not met in early life the poetry of Emerson and Walt Whitman...and those translations of the Upanishads."

But Yeats retracts his estimate: "Certainly I demanded of Russell some impossible things for I thought there could be no aim for an artist or poet but to express the Unity of Being."

A. E. too in his turn has to make a few comments regarding Yeats' art and poetry which we shall see later when we compare the two.

A. E.'s Work

From the first number of the "Irish Theosophist" in 1892 to the last issue in 1898, an almost uninterrupted outpouring of prose and verse attracted the attention of all to the arrival of a new writer who sometimes wrote under his name or initials or sometimes over the pseudonym, "A.E."

In A. E. can be found the achievement of the purpose which Charles Weekes renounced, following the withdrawal of his work. At the instance of Weekes he collected some of his poems and published them under the title, "Homeward Songs: By the Way". A second collection followed in 1897 as "The Earth Breath and Other Poems". These two volumes

established A. E.'s position as the supreme poet of mysticism and only second in rank to Yeats. A. E. is very sparing of publication: "Nuts of Knowledge" appeared in the year following and then "The Divine Vision". "By Still Waters" was published in 1906 and "Collected Poems" in 1913.

These poems are remarkable for their extreme in sincerity. A. E. writes of a need for self expression. His attempts are genuine records of truth as perceived by him and him alone. There is no superimposition of any external artistic impulse. His mysticism is entirely different from the mysticism or symbolism of Yeats. What is purely decorative in Yeats is in A. E. the expression of fundamental truth. If the writer of "Homeward Songs" chose to formulate his belief, he did it on behalf of a definitely spiritual propaganda. There is not the least vestige of literary affectation or pose.

A. E.'s main object was to illustrate from his personal experience the mystic faith that was in him. He did not, like Yeats, seize upon the artistic possibilities of mysticism. The externals that attracted the instinct for beauty in Yeats were entirely lost upon A. E. who was above all concerned with the inner meaning of the phenomena, the plastic value of which alone captured his imagination. Yeats allowed the aesthetic sense to outrage the transcendental commonsense of the true visionary.

A. E. is free from this fault: for the reality of his spiritual adventures imposes a restraint upon his artistic imagination. This factor is in a way responsible for some monotony in his work; but truth or reality does not wait for glittering phrases. One has to admire the constancy of the vision not the effectiveness of style.

"I know I am a spirit, and that I went forth in old times from the self-ancestral to labours yet unaccomplished; but filled over and again with the home-sickness, I made these homeward

songs by the way." Thus writes A. E. in the preface to his first book.

Homesickness of the Soul

This preface to the "Homeward Songs" summarises A. E.'s whole work. All his life he has sung of man's identity with the Divine Power, the Ancestral Self of Indian Philosophy. As we read the works of A. E. we find this constant consciousness of a larger life ever present in them. He does not only believe in the presence of this supreme power but also in the strivings of the human soul through millions of births and rebirths to reach the ideal. The law of Karma tells us that millions of lives must be consumed before one perfect life is produced. For thought to reach the highest plane we must plan, toil and agonise. For our "hearts to pulse with joy, countless hearts must be crushed by suffering." Most men climb the ladder to the spiritual heights, rung by rung, life by life, aeon by aeon. Few can fly from the bottom to the top at one bound.

The Hindu thinkers are conscious of the great gulf that separates the actual nature of man, which is bad, from the ideal, which is well nigh impossible. But the consciousness of the great distance between the actual and the ideal does not tempt them to distort the ideal itself. They therefore attempt to develop the infinitely precious ideal from out of the apparently refractory stuff of life.

Hinduism is the symbol of India's spiritual vision. It is based on the intuition of the oneness and the wholeness of the supreme spirit. On the belief that human life, everywhere and always, is a part and parcel of the Divine Being, it has cultivated a sort of religious hospitality. It recognises that more than one reading of the experience is possible. What A. E. says of Ireland is truer of India: "We are among the few races still

remaining on earth, whose traditions run back to the gods and the divine origins of things."

Visions

The poems of A. E. condense those moments of rapture when the seer has glimpses of some vision, reminding him of his immortal destiny, his absorption into the divine being. Of course the visions of A. E. are not the result of a life of discipline and penitence, as enjoined in the Hindu system, but of a body and soul so perfectly tuned that the reverie comes unannounced and without warning. The hours of dawn usually find the poet rapt in "Divine Vision" and to this fact must be assigned the numerous landscapes in his poetry, the beauty of which remains undiminished despite frequent repetition. It is natural that a Hindu will look with suspicion at this recurrence of external landscape in the description of vision, but an allowance has to be made for poetic licence, and exacting standards should be waived in recognition of the sincerity of the poet. Besides A. E. is a Westerner, writing for Western audience and we should appreciate the height attained; the lapses could be explained. It is a great thing in these times to touch even the fringe of truth. The days of seers and Rishis are over. Conditions of life are so complicated and exacting that it is difficult to preserve one's original purity of thought, feeling or experience, even if one sincerely wants to. And if in the stress of the highly complicated life of Ireland, A. E. can yet find time from his agricultural propaganda—he is the Editor of a leading agricultural magazine in Ireland—to record and receive vision, it is something to be thankful for.

To come back to A. E.'s poetry, one feels that the beauties of his verse are unconscious: the dusky valleys and twilight fields are merely incidental: they occur merely as the accompaniment of an idea, the prelude to a statement which constitutes the essential theme of a poem and its main motive.

The Superhuman

A. E. has a peculiar way of introducing the superhuman into a material setting. For example an angelic being would hover above a plougher as he works or the body of a woman would sometimes appear rising out of the ground. Such abrupt juxtaposition of superhuman figures in a perfectly normal setting is characteristic of A. E.'s poems as also of his vision. The reverie in his case is impulsive and unannounced. It is a sort of a hallucination with the difference that its results are pleasant not terrifying. No other outside personality is superimposed, but instead, the soul leaves its human moorings and comes in contact with the larger Presence. It reveals glimpses of eternity that flit to and fro. To A. E. such other-worldly moods or presences do not come with a surprise. They are to him as much the part of a natural scene as are the material objects.

We have quoted Yeats regarding A. E.'s demands in a work of art and his cultivation of the same. To him the artist and the poet are closely allied. The colouring in the first and the themes in the second are the part of a similar process. Thus it is that one finds in his poetry the same peculiarity as in his painting: a poem that reads at first as a simple picture of an evening tide, but gradually reveals the presence of a mystic "seer". The "Lonely road through Ireland" leads to something far beyond the image in the readers' mind of a typical Irish scene. Like the spiritual beings in his paintings, the mysticism of A. E. pierces through the word pictures and remains their central motive.

It is difficult to sum up all the vague longings of the soul in A. E. which reveal the presence of a perception instead of an exact body of belief that can be put in a cut and dried form. But it can be said with perfect safety that the main pre-occupation of A. E. is the relation of the soul with the eternal. With

few exceptions his poems tell of the quest of his spirit for the Universal Spirit. His pieces illustrate those supreme moments of ecstasy when the soul is rapt in communion with the Oversoul.

But the visions of A. E. are not so impulsive as they seem. They do not come to him at all times and all places. It is only after the cares of daily life are over and perfect peace prevails that the poet is fit for communion with the divine essence. Naturally the hours from nightfall till dawn are the most propitious to these visions of reality.

Symbolism

The frequency of twilight settings in A. E.'s poetry is due to the fact already stated. It is doubtless a part of that symbolism of which he says :

Now when the giant in us wakes and broods,
Filled with home yearnings, drowsily he flings
From his deep heart, high and mystic moods,
Mixed with the memories of the loved earth-things;
Clothing the vast with a familiar face
Reaching his right hand forth to greet the starry race.

The divinity of nature is an essential of A. E.'s faith. Everywhere he sees the spirit moving and actuating both the living and the dead. The Earth is the great mother of whom we are born and to whom we must return. The deity is everywhere. Some of his finest songs are hymns in praise of Earth: "The Joy Of Earth", "The Earth Breath", "In the Womb", "The Earth Spirit" or "The Virgin Mother".

It was no legendary youth that praised and preached the sacredness of the ground beneath. The soil of Ireland was sacred not only because of its common divinity as the source of life, but also because it was peopled by the heroes and goddesses of the Heroic age.

"A Call of the Sidhe," "Dana", "Connala's Well" and "The Children of Lir" are, for example, fusions of the local and the universal, which is a peculiarity of A. E. He has made the legendary lore of Ireland comprehensible in terms of Eastern mysticism. A. E. is intellectually a citizen of the universe, nay of the cosmos, but he is nonetheless an Irish incarnation.

A Contrast

The contrast between "A Call of the Sidhe" and the well-known "Hoisting of the Sidhe" of Yeats furnishes the fundamental difference between the two poets. In his poem, Yeats has contrived to present artistically the literary image of a popular Irish superstition, whereas A. E. refers the folk legend back to its origins where he finds analogies with his own visions. There is a certain incoherence of half revealed and half realised beauty and personal emotion in his attempt to transcribe what he saw when he grew "brighter-hearted with the vast", and his spirit soared "Unto the Light of lights in burning adoration."

The difference between the two poets is that Yeats is a symbolist, whereas A. E. is a mystic. They both use symbols, but the former does not succeed, as does the latter, in subordinating symbolism to the expression of truth. Yeats becomes enamoured, as it were, of the instruments and loses sight of the main purpose. A. E. is so completely possessed with the reality of the vision that the end dominates the means. He cannot mistake the "perfect lifting of an arm" for the eternal moment. In the "Symbol Seduces" he repudiates precisely the conception of beauty that Yeats has :

And while I sit and listen there,
The robe of beauty falls away.

From universal things to where
The image dazzles for a day.

He shuns the temptations of the momentary sensual pleasures of the world. In questions of the spirit, earthly values have to give place to higher impulses. Life with its veil of *maya* tries to hold back the seeker after truth in the prison walls that is life. As a matter of fact this is the first thing that a Hindu is taught. He is made to distinguish between the true and the apparently true which is false. Worldly joys, sorrows, and other pleasures are not real. They just help to keep the soul in bondage and lead it astray from its real goal which is the search after God or whatever one may term the all-pervading force or principle. To attain it, or be in the correct path of doing so, one must denounce and discard all worldly appurtenances. Even the quest for beauty, couched in harmless poetical phraseology, leads the searcher to the wrong path. A. E. knows this well and like a true Hindu renounces all that is of the earth earthy.

Away the great life calls; I leave
For beauty, beauty's rarest flower
For truth, the lips that never deceive;
For love, I leave love's haunted bower.

This is the renunciation of the true mystic who cannot mistake the shadow for reality.

From the very beginning A. E. has been conscious of this, of something other than the weaving of beautiful dreams. He has heard "rumours of the fierce pulsed city, far away," that breaks upon our silence and peace that "aureoles our rest", steeped in stillness, "as if some primeval day hung drowsily o'er the water's breast."

He has "shut the eyes that flame" and hushed "the heart that burns," so that in quiet he may hear "the old primeval cry: God gives wisdom to the spirit that upturns, let us adore you and I."

Age on age is heaped about us as we hear; cycles hurry to and fro with giant tread from the deep unto the deep: but do not fear, for the soul unhearing them is dead. In the prelude to the "Homeward Songs" A. E. says :

Oh be not led away;
Lured by the colour of the sun-rich day
The gay romance of song,
Unto the spirit of life doth not belong.

A. E. says in his poem entitled "Night":

All my thoughts are throngs of living souls;
They breathe in, heart unto heart allied,
Their joy undimmed.

In day-time, it seemed to him as if "from some titanic past, a thread of divine memory runs; born ere the mighty one began his dreams, or yet the stars and suns." Some, he says, "for beauty follow long, some there be, seek thee only for a song, I to lose myself in Thee." He knows where to rate the worldly desires and thoughts. The symbol seduces.

There in her old-world garden smiles
A symbol of the world's desire,
Striving by quaint and lovely wiles
To bind to earth the soul of fire.

Maya

Every Hindu knows what Maya is, or at least knows the use of the word as an expression of some idea about the unreality of the world. He may not comprehend its meaning, but the ancient philosophers set it as the first condition that a man must transcend his material circumstances before he could tread on the path of the realisation of truth or God. To approach things that are actuated by another principle, one has to adopt the appropriate tactics. It is a recognised rule of war. And

all spiritual effort is a war against the environment of man.

A. E. has acknowledged time without number and is fully conscious of the need of renunciation of all worldly objects, however pleasing their form, as art, music or even poetry, not to speak of the other really crude manifestations of the material world. He has a poem—as a matter of fact several—entitled *Maya* in which he fully realises where to place the lesser “glow of life”, the phrase signifying things of the world or the spirit of *Maya*. He writes :

Mother with whom our lives should be,
Not hatred keeps our lives apart :
Charmed by some lesser glow in thee,
Our hearts beat not within thy heart.

A. E. is fully conversant with the inherent antagonism between the life of spirit and the life of the world. What to Wordsworth was a foster mother is a mother to him too, but he is perfectly sure that the life as promised by nature or mother earth is not the life of the spirit. He is not very assertive about this point, may be he has not arrived at any definite conclusions regarding it, but we can hear faint whispers of the man who, though not sure, has his doubts. He confesses :

I heard them in their sadness say,
The earth rebukes the thought of God;
We are but embers wrapped in clay,
Mother, thy rudest sod to me
Is thrilled with fire of hidden day,
And haunted by all mystery.

But A. E. was a Celt with a long memory, ranging to generations and ages. Strains of pantheism are not unpleasant to encounter. They speak of a mind that is not a pure miracle of reason but is actuated by some other spirit that seeks its incarnation in things seen. John Eglinton writes : “Walking

in the woods, or by the sea shore, or among men, it often happens that a man experiences, a rising of the tide of perception, life inundates consciousness, and as it recedes, casts up in his brain a melody, a gospel, an idea."

It is after such moments of rapture that A. E. renews his contact with reality and gives us that "transcendental certainty" which John Eglington defines as our greatest need. "We can take no delight in the infinite of nature, unless we feel that we too are infinite." Reveries come to A. E. on those queer occasions when he renews his contact with reality :

The light shown down the streets
In the long blue close of the day :
A boy's heart beat sweet, sweet
As it flowered in its dreamy clay.
Beyond the dazzling throng
And above the towers of men
The stars made him long, long,
To return to their light again.
They lit the wondrous years
And his heart within was gay;
But a life of tears, tears,
He had won for his self that day.

A. E. is only too well conversant with the ephemeral nature of things material. He says :

And while I sit and listen there,
The robe of beauty falls away
From universal things to where
Its image dazzles for a day.

This is what Hindu seers have been teaching all the time.

What led Hindu thinkers to discuss the problem of reality was the transience of worldly things. The world open to our objective vision, seemed to them as endless "surpassing of itself". The philosophic attempt to determine the nature

of reality may start either with the thinking self or the objects of thought. In India the interest of philosophy was in the self of man. Where the vision is turned outwards, the external transitory events engage the mind. But in India, "Atmanam Viddhi"—know thyself—sums up the law of the prophets. Within man is the centre of all spiritual experience. The sources of spiritual insight are twofold—objective and subjective—the wonders of the world without and the stress of the human soul. In the Vedas the vast order and movement of nature engages attention. Their Gods represent cosmic forces. In the Upanishads we return to explore the depths of the inner world. "The self-existent pierced the openings of the senses so that they turn outwards; therefore man looks outwards, not inwards into himself; some wise man, however, with his eyes closed and wishing for immortality, saw the self behind", says the Katha Upanishad. A. E. among the moderns is such a wise man. He looks within:

The heaven lays hold on us; the starry rays
Fondle with flickering fingers, brow and eyes;
A new enchantment lights the ancient skies.

What is it looks between gaze to gaze;
Does the wild spirit of endless days
Chase through my heart some lore that ever flies?
Only I know that the vast within me cries,
Finding in thee the ending of all ways.

Through all the diversity of visible world and nature the true mystic finds and holds to one ultimate truth. He can rate the world at its true worth and try to concentrate on what is real—truth as perceived by his divine being. A. E. too is conscious of this Unity :

One thing in all things have I seen
One thought has haunted earth and air;

Clangour and silence both have been
Its palace chambers...every where
I saw the mystic vision flow
And live in men and woods and streams
Until I could not know
The dream of life from my own dreams.

It is a difficult state of mind, soul and spirit but without it the perception of truth is not possible. One has to be in a mood that can receive before one can be rewarded with real insight. A. E. being so constituted could see the outlines of truth and could hear whispers of the hidden being.

Being human and set in a material environment of the human body the soul is not always capable of piercing through the veil of falsehood. Even those who attain great spiritual heights are often assailed with doubts and difficulties. A. E. did. He would not have been human if he did not. But being above all a devotee of truth, as he perceived it, he set down his doubts in verse; for instance, in "On the Waters":

The boat drifts in the heart of heat,
In starry dances plays the light :

Yet I have grown so sudden old
Your laughter sounds afar. I seem,
One who waking tries to hold
A figure that he loved in dream,
And feels it lost beyond recall
The words unconquerable.*

The doom is spoken. It may be
That I shall never more forget
In all my thoughts of thee and me
The *Maya* wherein life is set.

*Note how a Tennysonian absurdity and commonplace of thought is avoided.

This wizardry shall still pursue
 All things we have found firm and fair
 Till life itself seem frail as dew
 Or bubble glittering in the air.

.....Oh let us fly
 There is some magic in this place
 Oh fly from the enchanted sea.

It will be superfluous commenting on Maya as conceived by the Hindus in view of its exposition by A. E. in the passage quoted.

As a matter of fact A. E. acknowledges his debt to the Upanishads in assailing the doubts that are wont to cloud the mind :

After reading the *Upanishads* :—
 Out of the dusky chambers of the brain
 Flows the imperial Will through dream to dream :
 The fires of life around it tempt and gleam :
 The knights of the earth fade and wane.

Passed beyond beauty, tempting dream on dream,
 The pure will seek the heart-hold of the light :
 Sounds the deep *Om*, the mystic word of night :
 Forth from the heart-hold breaks the living stream.
 Passed beyond the deep heart music-filled,
 The Kingly Will sits on the ancient throne,
 Wielding the sceptre, fearless, free, alone,
 Knowing in *Brahma* all it dared and willed.

This realisation of the life beyond and the utter inconsequence of the life of the world makes him impatient. Readers of Gita will regard this symptom with concern. But we can understand a man having impatience and not the means to check it. A realisation of truth is some thing after all, and there are many paths which lead to the same goal

whether they be realisation, yogic discipline, bhakti or a life of karma as enjoined by Lord Krishna. A.E. cries :

....O' hurry, hurry unknown shepherd of desires
And with thy flock of bright imperishable fires
Pen me within the starry fold, ere the night falls
And I am left below immutable walls.

Or am I there already, or is it paradise
To look on mortal, things with immortal, eyes ?

This will reassure the followers of Gita. His cry continues, recapturing for many the thrills that Western audiences felt while listening to the frenzied utterances of Swami Vivekanand and Ramatirath in the lecture halls of America and the Continent.

Hurry with me, not all ignoble as we seem,
Lured by some inexpressible and gorgeous dream.
The earth melts in my blood; the air I inhale
Is like enchanted wine poured from the Holy Grail.

Here we see A. E. attaining to the stage where man forgets his identity and finds himself merged in godhead. Here we see the divine frenzy coming and taking possession of the poet's soul :

A laughter in the diamond air, a music in the trembling grass;
And one by one the words of light as joydrops through my
being pass

I am the sunlight in the heart, the silver moon-glow in the mind
My laughter runs and ripples through the wavy tresses of the
mind

I am the fire upon the hills, the dancing flame that leads afar
A myriad lovers died for me and in their latest yielded breath
I woke in glory giving them immortal life though touched by
death

Even in the cricket in the grass, some dimness of me smiles and
hides
Where in the vastness too I burn through summer nights and
ages long,
And with the fiery-footed watchers shake in myriad dances and
song.

Slight Digression

It is difficult reconstructing the philosophy of A. E. as a unified whole. And it is a pity that the discussion has taken a desultory and casual form. It is futile seeking excuses for this because, as a matter of fact, A. E.'s thought is not at all *fitful* and occasional. His life was and has been a unified record of spiritual experience and progress.

Struck as he was since childhood with the apparent contradiction of life as perceived by the senses and the spiritual vision, he has progressed stage by stage. But in a study of this kind, which is essentially based on a literary background with no specialised philosophical training, one simply cannot resolve A. E. in a systematic whole. It would be well if some adept in Indian philosophy with a tolerable knowledge of Christian and other religions undertook a study of A. E. There are times when the apparent identity of Christian mysticism with Indian thought misleads a novice who cannot, either through lack of inclination or equipment, proceed to sift the various strains. Again, the presence in a large measure of ancient Irish pagan belief confuses the issues.

A. E., as has been said, progressed through very clear stages of spiritual experience and he has recorded them too in his two beautiful books of prose. Where his poetry has been the result of occasional contact with reality, his "Song and its Fountains" is the fruit of deep meditation. But it is too early turning to his prose books. We have not as yet seen A. E.'s conception of God, soul or eternity. It will not be out of place here to mention

that some of A. E.'s poems look like actual transcriptions of the utterings of ancient Indian sages. This is not plagiarism of thought but the result of identity of souls. When a man realises himself, it is futile to apply to him earthly values or standards. Identity of thought is possible without actual contact, just as perception of truth is possible without hearing it defined by anybody else. According to a favourite saying of Swami Ramatirath, when a man has realised his oneness with God all knowledge, all wisdom and all learning lie open before him. The veils of ignorance are parted and man confronts truth and perceives it without the orthodox aid of schooling or passing through the prescribed stages. Kindred spirits think alike and it is no wonder that A. E. utters identical truth with the rishis of ancient India. This to my mind is the strongest proof of A. E.'s kinship with Indian philosophy and that is why in the method followed till now, the poet has been permitted to state truth in his own words without our corroborating it by suitable quotations from Hindu books. Wherever a difference has been felt or an explanation needed, appropriate comment has followed.

Exception might be taken to my introducing a diversion at this stage. But an explanation should never be unwelcome, howsoever late. Besides, difficulties do not appear all at once even before one has undertaken the task. With A. E. they come as one proceeds and in myriads.

A. E.'s Process

Reverting to our subject, it might be useful to indicate the process by which A. E. arrives at truth as well as his attitude in approaching spiritual experience. Incidentally this will be found to be in itself an elaboration of his faith and philosophy. For spiritual experience is an organic growth. It proceeds from the first faint glimmering of truth to the ultimate perception of reality. In between is a fruitful soil worthy of

exploration by those interested in psychology.

A. E. was ever a dreamer. We have quoted Yeats to indicate the impression created by him on those who observed him. He was always held in awe because people knew that he was receiving visions continually. We shall quote A. E. presently to show how he was receiving those visions.

When the inner and the outer first mingle, it is the bridal night of the soul and the body. Of course this mingling of the soul and the body is not a simple chemical experiment; it is the result of an intense and elaborate process of meditation, for without meditation it is impossible to arrive at an understanding of man or the surrounding phenomena. A. E. explains this process of meditation :

“In this meditation we start from where we are and go backward through the day; and later on, as we become quicker in the retracing of our way, through weeks, through years, what we are passing into and what we did or thought the moment before, and that into its antecedent; and so we recall a medley of actions, passions, imagination or thought.”

The sages enjoined this meditation with the intention that we might conquer in imagination, where we had been weak, kill the dragons which overcame us before, and undo what evil we might have done.

A. E.'s moods began to hurry him back to their first fountains. As he says, to “see our lives again” is to “have memories of the lives and intuitions of many others, to discover the powers we had not imagined in ourselves, who were the real doers of our deeds, to have the sense that a being, the psyche, was seeking incarnation in our body.” In his “Desire” he says:

The spirit moves in through eternities.

Ah, in the soul what memories arise :

And with the yearning inexpressible,

Rising from forgetfulness I turn

To thee, Invisible, Unrumoured, still :
 White, for thy whiteness all desires burn.
 Ah with what longings once again I turn.

Note the vedantic definition of God: we shall see more of it.

It is

In miracles of fire that he symbols forth his days
 In gleams of crystal light
 Reveals what pure pathways
 Lead to the soul's desire,
 The silence of the height.

A. E.'s introspective meditation and visions tell him of the eternal nature of man without a realisation of which the conception of eternity would be far from soothing.

Life of infinite pity, star, the grey dusk of our days;
 Surely here is soul : with it we have eternal breath :
 In the fire of love we live, or pass by many ways :
 By unnumbered ways of dream to death.

But the child, he says, "does not know the distant thunder of the deep, he goes to...We cannot waken in the dreamer or point him out the fate, that is ordained in the past, for the soul in the first kiss of the body, renews an ancient love. And in this kiss, however gentle, are all the desires that brought it back to the world."

In the ancient shadows and twilights
 When childhood had strayed,
 The world's great sorrows were born
 And its heroes were made
 In the lost boyhood of Judas
 Christ was betrayed.

In that retrospective mood too, A. E. regained memory of the greatest of all wonders of boyhood: Earth revealed itself to him as a living being and rock and clay were made transparent

so that he saw lovelier and lordlier bodies than he had ever known before.

"Though the walls around the psyche have thickened with age," confesses A. E. "and there are many heavinesses piled upon it, I still know that the golden age is all about us, and that we can, if we will, dispel that opacity and have a vision, once more, of ancient beauty." It is such strong faith and belief that is responsible for the freshness of A. E.

The sight of a dying old woman, weeping because she could not arise and nurse a sick neighbour, says A. E., brought about in his soul a transfiguring anguish. "I passed from it to many egoisms, but this was the starting point of whatever unselfishness was in my life." Yet because the love of beauty was the first born of the union between soul and body, A. E. could never be like "Plotinus and place the good above the beautiful." Here A. E. enunciates the cardinal difference between himself and Yeats. Writing about Yeats he says, as in himself, in all those with whom he came in contact, he found in each of them, a governing myth. He found that somewhere in their past, from the first bridal of the soul and body, a germinal mood had been born which had dominated over everything else in them.

Yeats' Shadow

"I can see to-day," he writes, "the central idea, surmised 45 years ago in the young Yeats grown to full consciousness. When a boy, I showed some drawings to Yeats: and I wondered that what interested him most of all was the drawing of a man on a hill-top, amazed at his own shadow, cast gigantically on a mountain mist."

A. E. says that he soon found out that his imagination was dominated by Yeats' own myth of a duality of being and shadow. "I think at the first contact of the outer and

the inner, he became aware of a duality of being”.

A mere child, A. E. dreamt that he was of the children of light. In imagination he wandered outside the circle of light and, he says, he became aware of a dark presence and trembled, for he knew that it was one of the children of darkness. But this being whispered to him that “we of the darkness are more ancient than you of the light”, he forsook his allegiance to the light and his whole being “Yearned to lose myself in divine darkness”. This record is interesting as it indicates his spiritual progress. Light and darkness all owe their origin to the same impulse, “in the beginning was the word” and it was neither dark nor bright and the divine and the all powerful spirit brooded in loneliness ;—brooded not in the orthodox Christian interpretation of the word but in the sense the Indian Rishis understood it. Brooding is not an intellectual phenomenon but a vast process which is only inadequately covered by the word “tapasiya”.

However in A. E. this was the beginning of the spirit of revolt. Spirit of revolt is necessary both in movements of the nations as well as of spirit. It gives a broader sympathy and heralds the coming of freedom either from political subjection or the subjection of the carnal flesh. It leads to a fuller conception of liberty which after all is the quest of both society and the soul.

A. E. gives expression to the spirit of freedom in a beautiful poem :

I love the free in thee bird,
The lure of freedom drew;
The light you fly towards my bird,
I will fly with thee unto.

And there we yet will meet my bird,
Though far I go from you,
Where on the light outpoured my bird,

Are love and freedom too.

This spirit of revolt later sank to more mystical depths, but it was from the original fountain of that dream that many poems came like this one :

They are but the slaves of light
Who have never known the gloom,
And between the dark and bright
Willed in freedom their own doom.
Pure one from your pride refrain,
Dark and lost amid the strife,
I am myriad years of pain
Nearer to the fount of life.

After this quotation it is difficult to refrain from discussing straightaway A. E.'s conception of God; but we have to clear a little more of ground before we take up the final task in the examination of A. E.'s work.

When A. E. was five years old he read a children's book, called "Magic". The book fascinated him and lay in his memory until a dozen years later its full transcendental significance came home to him. The harmony of blue and silver blue bewitched him and then the love of colour awakened. This love of colour to him seemed instinctive in the outer nature and it was only in that introspective imagination that he could see that the harmonies that delighted him had been chosen by a deeper being and were symbolic of its nature and not of the unthinking child. In this light how pale and tawdry Yeats' cabalistic jugglery seems. A. E. explains "I think it was because in the first contact of soul and body I could remember beauty was born, that in later life I accepted ideas, philosophies and cause for the beauty they suggested, and I have always shrunk from any activity in which I could not see the magic thing". This statement divorced from its context will seem a very abject surrender and an approximation to Yeats'

ideas. Actually it is not. A. E.'s instinct for beauty has its source not in the senses but in the spirit of the Divine Being. Beauty as perceived by him is an indication of a higher harmony and does not depend on a mere senseless mixing of colours or precious turns of phrase. It has no physical appeal :

Image of beauty when I gaze on thee,
Trembling I waken to mystery,
How through one door we go to life or death
By spirit kindled or the sensual breath.

Image of Beauty, when my way I go;
No single joy or sorrow do I know :
Elate for freedom leaps the starry power,
The life which passes mourns its wasted hour.

And ah! to think how thin the veil that lies
Between the pain of hell and paradise!
Where the cool grass my aching head embowers
God sings the lovely carol of flowers.

The flower of beauty blooms afar withdrawn. It is not manufactured in studios or séances. Similarly when A. E. sings of love it is not the love celebrated in contemporary poetry but of another world. Its essence is different. It is just a reflection of the great love that is in God.

We liken love to this or that, our thought
The echo of a deeper being seems:
We kiss because God once for beauty sought
Within a world of dreams.

Or

I sometime think a mighty lover
Takes every burning kiss we give:
His lights are those which round us hover:
For him alone our lives we live.

As for the worldly love as conceived by poets and rhymers to soothe madonnas of go, languishing in richly appointed drawing-rooms:

No, it is not love but scorn of time,
It turns to dust beneath the years.

A. E. in thought, ideas and visions is so like a Hindu devotee that it is difficult to keep in mind the fact, while studying his works, that he is an Irishman. Even there are poems which use Sanscrit words and phrases and the impression created is that of reading splendid transcriptions of our philosophical books or hymns. His soul is entirely in tune with the infinite. His very phase of life is steeped in some hidden divine symbol and every moment of it is lived in unison with God.

Transmigration of the Soul

Having come so far, it seems superfluous trying to prove or elaborate A. E.'s belief in the soul or its transmigration. It has been stated several times that A. E. is a kindred soul. Wisdom and perception of truth are inherent in him.

When he was a boy he began to run in and out of the house of dream. An age of spirit, he says, would fall upon him. Yet something of that ancientness of psyche clung to the boy. He realised, with a kind of anguish that a gulf had widened between himself and normal human life. But

Out of the vast the voice of one replies
Whose words are clouds and stars and night and day,
When for the light the anguished spirit cries
Deep in the house of clay.

And A. E. found a separation growing between himself and home and love. In the house of dream he entered, there was neither home nor love but beyond him were intimations

of primeval beings and profundities like "the Pelroma". He found about his self that

It seeks a deeper silence still
It folds itself around with peace,
Where thoughts alike of good and ill
In quietness unfostered cease.

Looking back at the past he says, he has a vivid sense of a being seeking incarnation "beginning with those first faint intuitions of beauty, and those early dreamings which were its forerunners."

It was no angelic being, pure and new from a foundry of souls, which sought embodiment, but "a being stained with the dust and conflict of a long travel through time, carrying with it unseated desires, base and august, and as I divined of it, myriads of memories and a secret wisdom." It was not simple but infinitely complex as a being must be which had been in many worlds, and all it experienced had become part of it.

If there was an original purity of being, it had become corrupted, yet not altogether, for "there was in it some uncorruptible spiritual atom, carrying with it may be, some memory of its journeying with Deity. It had worshipped in many houses of prayer and had kept the reverence it had paid and had been in many a gay and ruined heart." Out of ancient happiness it could build intoxicating images of life, out of sorrows it could evoke everlasting wisdom that could crucify infant joy ere it could run to its light. It was such a being that A. E. surmised within him, trying to "tune the body to be sensible to its own impulses by a glamour cast upon desire and also vision, dream and the illuminations of intuition and conscience." He gives expression to this unfolding of true knowledge and vision in his poem entitled "The Mountaineer":

Oh, at the eagle's height
To lie in the sweet of the sun,
While veil after a veil takes flight
And God and the world are one.

The call of the Sidhe is more imperative and definite:

Tarry though yet late loungee in the twilight's glory:
Hush, not a whisper, let your heart alone go dreaming.
Dream unto dream may pass: deep into the heart alone,
Murmurs the Mighty One his solemn undertone.

These flashes of consciousnesses often impelled A. E. in such contrary directions that he divined a dual nature in the psyche. It was a being in part avidly desirous—here we are on ticklish ground—while another part was cold to this, but was endlessly seeking for the spirit.

"In normal thought", says A. E., "the fusion between inner and outer is so swift that it deceives the most attentive sense to the idea of unity, and we come to believe that there is no creator of thought other than the thinker who resides in the brain, who is within us from moment to moment, and we do not know what rays from how many quarters of heaven are focussed on the burning point of consciousness."

But A. E. tried to keep these glittering visitations long enough to submit them to searching analysis.

"Then I remembered", says A. E., "that a poem is the most intricately organised form of thought, and in the coming of being of poetry, there is the greatest intensity of consciousness. Sometimes at the apex of thought, I have almost surprised the creator of it peering at me.

"In the exploration of dream we acquire some knowledge of the working of that mysterious psyche. And at times in the making of poetry, I have been able to discover the true creator of the poem, withdrawn from within from the waking consciousness. The poem seems like an oracle delivered to the

waking self from some dweller genii in the innermost."

A. E. speaks of poetry because by reason of the intensity involved in its creation, he can remember more of the circumstances and is more aware of the duality in his being, of the interactions between the inner and the outer, and of the same mystery in its making as in the creation of a dream.

Pure one from your pride refrain
Dark and lost amid the strife
I am myriad years of pain
Nearer to the fount of life.

At the beginning of the *Sevatasavatra* we read: "Whence are we born, where do we live, and whither do we go? O ye, who know Brahman, tell us at whose command we abide here whether in pain or in pleasure. Should time or nature, or necessity or chance, or the elements be considered to be the cause, or He who is called Purusha, the man, that is the Supreme Spirit?"

In the *Kena Upanishada* the pupil asks: "At whose wish does the mind set forth proceed on its errand? At whose command does the first breath go forth, at whose wish do we utter this speech. What God directs the eye or the ear?"

The thinkers did not take experience to be an inexplicable datum, as commonsense does. They wondered whether the report of the senses could be taken as final. Are the mental faculties by which we acquire experience, self-existent, or are they themselves the effect of something mightier still, which lies behind them all? A. E. has found an answer.

How can we consider physical objects, effects and products as they are, to be quite as real as their causes? There must be something ultimate at the back of it all, a self-existent in which alone the mind can rest. Knowledge, mind, the senses and their objects, are all finite and conditioned. We cannot get true happiness from the finite. The pleasures of the world are

transient, being cut off by old age and death. Only the infinite gives durable happiness. In religion we cry for eternal life. All these force upon us the conviction of a timeless being, a spiritual reality, the object of philosophical quest, the fulfilment of our desires and the goal of religion.

The seers of the Upanishads try to lead us to this central reality which is infinite existence, *Sat*, absolute truth, *Chit*, and pure delight, *Anand*. The prayer of every human heart is: "Lead me from the unreal to the real, lead me from darkness to light, lead me from death to immortality."

In the *Taittiriya Upanishada*, the son approaches the father to learn from him the nature of reality from which all things flow and to which all things return. The son is given the general features of the *Brahma*: "That from which these things are born, and that into which they enter at their death or ceasing, that is *Brahma*." Things of the world are ever changing their forms and as such cannot be called real in the ultimate sense. The son soon discovers that matter cannot account for the life phenomena. He hits upon *prana*; matter does not hold the secret of life though life cannot exist without *prana*. There is something in life that enables it to absorb and transmute the inorganic elements. This something is the vital principle that in man helps to change the vegetable product into blood, bone and muscle. It is the principle that pervades the universe and binds human beings with the rest of the creation.

The son is yet dissatisfied with the solution of *prana* as the ultimate reality, for the conscious phenomena which we come across in the animal world is not explicable by the principle of life. *Manas* or perceptual consciousness is a product distinct from life and matter. And the son believes that *manas* is *Brahma*. Even this will not suffice for there are intellectual facts which mere perceptual consciousness does not take into account. He realises that even intellectual consciousness is incomplete, being subject to discord and imperfection.

It is the aim of the Upanishadas to point out that the elements of duality, which we have seen in the case of A. E., persist at the intellectual level howsoever we may try to overcome them. But A. E. in his philosophy does not go beyond the intellectual plane, though he comes face to face with reality through the aid of visions or, as the Hindu would term it, the *bhakti marg*, or the path of devotion.

The efforts of religion are to enable man to realise the divine in him, not merely as a formula, but as the central fact of his being, by growing into oneness with Him. The way to reach this religious experience cannot be prescribed. The soul of man whose nature is infinite has unlimited possibilities. The God whom it seeks is equally infinite and wide.

The reactions of an infinite soul to infinite environment cannot be reduced to limited forms. The Hindu thinkers realise that the inexhaustible variety of life cannot be fixed to appointed moulds. A familiar text says: "As the birds float in the air, as the fish swim in the sea, leaving no trace behind, even so are the paths to God, traversed by the seekers of the spirit." "Whoever comes to me through whatsoever form, I reach him", says the Lord in *Gita*.

However, distinctions have been made, and the three-fold activity of human consciousness is the *Jnanmarga*, or the path of knowledge and insight, the path of *bhakti* or devotion, and *Karmamarg*, the path of service and action. The three—right knowledge, right desire, right action—go together. The first reveals to us the truth, the second instils in us a love for it and the third moulds our life.

But this digression is getting much too long. We only wanted to point out the difference in the conception of A. E. and that of the Hindus, to show how intellectual perception is the highest form which A. E. could reach.

In our system, this is a higher mode of realisation but above it is a greater one where action, feeling, sense and intel-

lect are left far behind; for God is not bound by any of these qualities but far transcends them all.

The unity of existence requires that we must transcend the intellectual level. Thought as ordinarily understood deals with objects, viewed as beyond or other than the process of thinking. It reaches outwards of itself to a something other than itself.

Reality is different from thought. It can be reached in the *twirya* state of the highest immediacy, which transcends thought and its distinctions, where the individual coincides with the Central Reality. *Ananda*, or delight is the highest fruition, where the knower, the known and knowledge become one. Here the philosophic quest terminates.

Really speaking no description can be given of this state, though intellectual necessities have led some of the Hindu thinkers make an attempt. But by its very nature the attempt is futile, for whatever is said now has to be contradicted the next moment.

In the case of A. E. we need not make fine distinctions about the method through which he has achieved his conception of reality. The important fact for us is how does he conceive reality. Religious paths are for the uninitiated. Those who have achieved true knowledge need not be bothered about the path or method they have pursued. For some men it is not even necessary to go through any stage at all; they are born in tune with the all pervading spirit.

Conception of God

A. E.'s conception of God is surprisingly close to that of the Hindu seers. One can even discern identity of phrases and terminology used. In his poem entitled "Dana" he ventures a definition of God:

Too vast and vague, they know me not but yet,
 I am the heartbreak over fallen things,
 The sudden gentleness that stays the blow,
 And I am in the kiss that foeman give,
 Pausing in battle and in the tears that fall
 Over the vanquished foe, and in the highest,
 I am the last
 Council of mercy.....

In the "Divine Visitation" he tells us:

Does the wild spirit of the endless days
 Chase through my heart some lore that ever flies?
 Only I know the vast within me cries
 Finding in thee the ending of all days.

Thus in the *Katha Upanishada* :

"Sir, on what does the infinite rest? On its own greatness or not even on greatness." "Everything hangs on it and it hangs on nothing: As all spokes are contained in the axle and in the felly of a wheel, thus also all beings and all gods and all worlds and all organs, also are contained in that Self." "There is that ancient tree whose branches go downwards and whose roots go upwards. That is the Bright Brahman, the immortal, all worlds are contained in it and no one goes beyond Him". Brahman and atman or the soul, the objective and the subjective, the cosmic and the psychical are one and the same.

And the restless ploughman pauses,
 Turns and wondering
 For a fiery moment looking with the eyes of God
 Over fields a slave at morning
 Bowed him to a sod:
 Blind and dense with revelation
 Every moment flies.

Thus writes A. E. in his humanistic poem called "The Earth Breath". The following is the definition of the Supreme Being in Gita:

He is within all beings—and without—
Motionless, yet still moving; not discerned
For subtlety of instant presence: close
To all, to each; yet measurelessly afar;
Not manifold, and yet subsisting still
In all which lives.
The light of lights, he is in the heart of the dark,
Shining eternally.

Confusingly contradictory, but all definitions of God must be such.

Supreme Unity

A. E. writing about the supreme deity says: "I do not know indeed, but I suspect of that inner being that it is not one but many, and I think we might find, if our meditation were profound, that the spokes of egoity ran out to some celestial Zodiac. As in a dream the ego is dramatically sundered into This and That and Thou and I, so, in the totality of our nature, are all beings, men have imagined, aeons, archangels, dominions and powers, the hosts of darkness and the hosts of light; and we may bring this multitudinous being to a unity and be inheritors of its myriad wisdom." He writes in his poem "Star Teachers":

These myriad eyes that look on me are mine;
Wandering beneath them I have found again
The ancient ample moment, the divine
The God-root within men.
For this the lights innumerable
As symbols shine and we the true light win;
For every star and every deep they fill,
Are stars and deeps within.

In his "Three Councillors" A. E. says:

It was the all-seeing soul
Who counselled neither war nor peace:
"Only be thyself the goal
In which the wars of time shall cease."

We have almost finished our survey of A. E. and it will not be out of place to quote at this stage a poem, entitled "Om" in which he expresses his predilection for Indian philosophy. This will also save us from the necessity of writing the orthodox conclusion to a study. It is superfluous to say that A. E. shows definite strains of Hindu philosophy and that he is a seer, because all these points have been elaborated in these pages. Besides, there is another poem "Indian Song" which may also be aptly quoted. In conclusion we shall reproduce a poem that will sum up in a small way A. E.'s idea of the state of Ultimate freedom or Nirvana. No comment need follow because it has been shown how at places A. E. differs from Indian views and why.

Om

Faint grew the yellow buds of light
Far flickering beyond the snows,
As leaning o'er the shadowy white
Morn glimmered like a pale primrose.

Within an Indian vale below
A child said "Om" with tender heart,
Watching with loving eyes the flow
In dayshine fade and night depart.

The word which Brahma at his dawn
Outbreathes and endeth at his night
Whose tide of sound so rolling on
Gives birth to orbs of pearly light;

And beauty, wisdom, love and youth,
By its enchantment gathered grow.

Indian Song

Shadowy petalled like the lotus,
loom the mountains with their snow
Through the sapphire *soma* rising such a flood of glory throws
As when first in yellow splendour Brahma from the lotus rose
High above the darkening mounds
where fade the fairy lights of day
All the tiny planets folks are waving us from far away;
Thrilled by Brahma's breath
they sparkle with the magic of the day
Brahma all alone in gladness,
dreams the joys which throng the space
Shepherds all the whirling splendours
onward to their resting place.

The Twilight of Earth

The wonder of earth is o'er:
The magic from the seas is gone
Oh what is worth this lore of age
If time shall never bring us back ?
Oh while the glory sinks within
Let us not wait on earth behind
But follow where it flies, and win
The glow again, and we may find
Beyond the gateways of the day
Dominions and ancestral sway.

A charming poem which need not worry us because of its philosophical contents is entitled "Krishna". It illustrates in a remarkable manner how A. E. has caught the spirit of Indian song and devotion :

I paused beside the cabin door
and saw the King of Kings at play
I saw him pass from love to love,
and yet the pure allowed his claim.
To be the purest of the pure,
thrice holy, stainless, without blame
I saw the open tavern door flash
on the dusk a ruddy glare
And saw the King of Kings outcast,
reel brawling in the sunlit air.

(Not a typical Hindu note, however:)

And yet he is the Prince of Peace
of whom the ancient wisdom tells
I saw the King of Kings again
a thing to shudder and to fear,
A form so darkened and so marred
that childhood fled if it drew near.
And he is the Light of Lights
whose blossoming is paradise
I saw the King of Kings again,
a miser with a heart grown cold,
And yet he is the prodigal,
the spendthrift of the heavenly gold
I saw the King of Kings descend
the narrow doorway to the dust
With all his fires of morning still,
the beauty, bravery and lust.
And yet he is the life within
the everliving living ones,
The ancient with eternal youth,
the cradle of the infant suns
The fiery fountain of the stars.

SECTION II
POLITICS



THE OFFICIAL BLOC IN THE INDIAN LEGISLATURE

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Introduction

In its early stages the Indian Legislature, or to be more precise, the Governor-General's Council for law-making purposes, was merely an expansion of his Executive Council. The famous Charter Act of 1833, which gave India its first rudimentary Legislature, provided that for making laws and regulations the Executive Council of the Governor-General was to be enlarged by the addition of a Law Member. Later on, in 1853, the Law Member was assigned a permanent seat on the Executive Council, which was further enlarged, for purposes of legislation by the addition of six members viz., the Chief Justice of Bengal, another puisne judge and four officials of the Company appointed respectively by the four Provincial Governments. But even under the Reforms of 1853 the Indian Legislative Council was an exclusively official body.

The non-official element was first introduced into our Legislature by the Indian Councils Act of 1861, which provided for the appointment of twelve additional members to the Council, half of whom were to be non-officials. Though the appointment of the additional members rested with the Governor-General, provision was thus made for the association of our countrymen with the work of legislation. The powers and functions of the Legislative Council were, however, rigorously restricted. The members were forbidden to move resolutions

or offer suggestions on any matter other than the Bill under consideration; they were not even allowed to interpellate the Government. The business of the Council was, in fact, confined strictly to legislation, and in that regard too, numerous limitations were placed. Consequently, until the introduction of a quasi-elective principle into the Indian Legislature, in 1892, the fundamental principle of the Constitution was not departed from. The principle was that "So far as legislation is concerned, the Government consists of the Governor-General or the Governor, his ordinary members and the additional members whether nominated by him or elected, subject to his approval, and all form but one component and indivisible part of Government for the purpose of making laws and regulations."¹ Owing to the very restricted field of action allowed to the Legislative Council and having a standing majority to its side the Executive did not yet deem it necessary to deprive the official members of their liberty of expression or freedom of judgment. All members of the Legislative Council, official and non-official were, free to speak and vote according to their personal convictions. The officials and non-officials of the Legislature co-operated as one body and the feeling hardly arose that the non-official members formed an opposition. They could scarcely do so, for they were directly appointed by the Governor-General who naturally chose such non-official Indians as were most likely to co-operate with the Government and endorse its policy. No need was, therefore, felt for compelling the official members to vote together in the Legislative Council any more than they did in the Executive or other matters outside the Council. The members of the Executive Council alone, strictly speaking, formed the Government, and although they might differ, howso-

¹ Note by Sir V. B. Aiyangar to the Government of India, Nov. 22, 1908, on the proposed enlargement of the Legislative Council and establishment of Advisory Councils (*Papers Relating to Indian Constitutional Reform*, 1908, Vol. I, p. 56).

ever strongly among themselves on any particular issue, it was considered proper that when the matter came before the Legislature as a Government measure they should all support it. But up to the year 1892 this convention was not applied to the 'additional' official members, and on looking up the proceedings of the Legislative Council one finds that when divisions were recorded in it, official members were, on several occasions, as much divided among themselves as the non-officials.

Rise of the Official Bloc

What were the new factors, then, which conspired to set aside the fundamental principle of the constitution by creating an 'official bloc' in the Indian Legislature in 1892? The Indian Councils Act passed in that year further enlarged the Legislative Council and empowered the members to interpellate the Government and to comment upon the annual Financial Statements. But what particularly concerns us here is that a quasi-elective element was introduced in the Legislature. The number of nominated additional members was raised from 12 to 16 and of these 6 were to be officials and 10 non-officials. Of the 10 non-officials 5 were to be directly appointed by the Government and the remaining 5 were to be nominated by him on the recommendations of the four Provincial Legislative Councils and the Calcutta Chamber of Commerce. In practice, however, the Governor-General always nominated persons recommended to him by these bodies respectively. The maximum strength of the Legislative Council was thus raised to 24, including the Governor-General, and its composition came to be as follows:

Members of the Governor-General's Executive Council ..	7
Officials nominated by the Governor-General	6
Non-officials directly appointed by the Governor-General ..	5
Non-officials nominated on the recommendations of the Provincial Legislatures	4

Non-officials nominated on the recommendations of the Calcutta Chamber of Commerce. I

The mere introduction of non-official members into the Legislature, whether by direct nomination or by indirect election, subject to the approval of the Governor-General, did not affect the constitutional aspect of the question, namely, that all official and non-official, members, elected or nominated, were alike the colleagues of the Governor-General and of the 'Ordinary' members of the Council in the exercise of their legislative functions. There was nothing in the Statute affecting the status of the newly formed Legislative Council as the Government for the purpose of making laws and regulations. No distinction, whatever, was contemplated in the Act, in regard to the part which, the various elements assembled in the newly created legislature, were to play. But while the constitutional position remained unaltered, the creation of an 'official bloc' in the Legislature under the orders of the Government of India, entirely changed the political aspect of the question.

The new class of elected members, henceforward associated with the work of legislation, did not directly owe their seats in the Legislative Council to the Government. Naturally, they considered themselves more free to press the public point of view and to criticise the Executive more strongly than their fellow-nominated members had been accustomed to do. This independence of their position was reflected in the role of opposition which they occasionally took on the floor of the Council; and, at times, they also succeeded in obtaining support from the directly nominated non-official members, in their criticisms of the Executive. The right of asking questions and of making comments upon Financial Statements provided our members with new weapons of attacking the policies of the Government and in bringing home to it the grievances of the people.

The debates became more interesting and their tone was

gradually rising. Quite a large proportion of the non-official members were lawyers, and they evinced a fair degree of insight into political and administrative questions by putting forward sound and convincing arguments in support of the policy they advocated. Their criticism of the Executive was growing more acute than what the latter had been facing so far. The official members who came in the legislature as representatives of their respective province would occasionally speak for their province and often voiced local views which were, in a good many cases, distinct from and even opposed to the views taken up by the Central Government. They too would not hesitate to criticise and oppose the Government when the latter failed to meet the financial demands of their province or refused to accept their suggestions on other matters. Under the circumstances, the Government, rightly thought, that voting, when there was any, could not be left to the balance of argument as it was often likely to go against it. It apprehended that some of the official members may be won over in open debate on certain questions by non-official members thus placing the Treasury Benches in a minority, in spite of a statutory official-majority in the Legislature. And, being anxious to have all its own way, even when its cause would fail to elicit support from a majority in the House as a result of a clean debate, the Government laid down the convention that all official members of the Legislative Council, ordinary, as well as additional, were in honour bound to support it in debate and voting alike. The official members of the Legislature were thus compelled to form a distinct group of their own on the simple principle of their common allegiance and fidelity to an all powerful Executive of which they were the servants. Thus arose the 'Official Bloc' in the Indian Legislature.

The principle of the Constitution, which we noted before, was ignored for the notion that there must be an official majority in the Legislative Council and that the additional official

members should always vote with the ordinary members of the Council was entirely opposed to it. The whole of the Council constitutionally speaking, was one body and co-operation among its members was desired rather than division. As Mr. Iyengar put it: "The division of this body by an Executive Government, permanently backed by an official majority and a non-official minority corresponding to an opposition to Government was the introduction of the principle which, in British India, is as unconstitutional as it would be mischievous in result."¹

Reasons for setting up the Official Bloc

Having taken stock of the constitutional factors which suggested to the Government this objectionable convention we may now examine the chief motive underlying the decision of the Government in setting up such an unconstitutional procedure. Although the elective element in the Council, as provided for under the Act of 1892, was meagre, acute differences of opinion arose between the members not only in regard to various administrative and legislative measures but also as to the goal of the country's political evolution. The Indian National Congress was founded in 1885 and it began to attract the cream of our country's talent under its fold and soon became the chief embodiment of her national and political aspirations. It demanded radical changes in the constitution of the country with a view that the people may have a larger share in the administration of their land and focussed its attention on the removal of various grievances of the public. Some constitutional progress was, as we have seen, made under the Act of 1892 but it was not likely to satisfy our public-men. For, neither any substantial powers were given to the Legislatures,

¹ Note by Sir V. B. Aiyangar to the Government of India, Nov. 22, 1908, on the proposed enlargement of the Legislative Councils and establishment of Advisory Councils (*Papers Relating to Indian Constitutional Reforms*, 1908, Vol. I, p. 56).

nor did the Government seriously attempt to remedy the long standing grievances of the people or took effective and far-reaching measures for the moral and material progress of our countrymen, which had been consistently demanded. Failing, therefore, to take the people and their representatives into its confidence, the Government could not always expect to win an honest support in the Legislature for its measures and policies which were disapproved of and opposed by our members if all the members were free to exercise their judgment and vote according to their individual convictions. The conscience of the Government began to prick it deep and it rightly feared that even some of the official members would, on certain occasions, join hands with the opposition and reduce it to a minority in the House. But the Executive was anxious to avoid such a contingency, not because an adverse vote in the Legislature would forbid it from carrying on its policy and giving affect to its proposals, for it possessed vast powers of independent legislation, but because it did not wish it to be known to the people at large that the Executive was forcing measures in defiance of a majority in the Legislature composed of both officials and non-officials. The Executive wanted to have a standing majority to its side in order to show to the world outside that it duly respected the verdict of the Legislature and that the policies it adopted and the measures it promulgated were not autocratic and dictatorial but rather had the sanction of the Legislature, howsoever indolent though it might be. Politics is not a fair game, and accordingly, the Government laid down the convention requiring all official members of the Legislature to support and vote for the Administration, on all occasions, whether they themselves approved of its measures or not.

The Government of India, however, took a simple constitutional view of the matter. It advanced the usual constitutional plea namely, that the Indian Government owed its responsibility to the British Parliament which was the Supreme

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authority and maintained that it could not accept an adverse majority vote in the Council as a decision bringing it a release from this responsibility. It was true, no doubt, in 1892 as it is to-day that the Indian Government is responsible not to an Indian Legislature but to the British Parliament. But how could an adverse majority vote in a Legislature, which was merely an advisory body and to which the Indian Government was constitutionally irresponsible, release it from its responsibility to the Home Government unless it was prepared to give full effect to the wishes of that Legislature in preference to its own views ? Sufficient provisions were made under the Act for safeguarding the constitutional responsibility of the Executive in India to the Home Government. The Governor-General in Council possessed, besides supreme executive power, a very effective veto on legislation including the powers of certification, authorisation and disallowance and of issuing ordinances. The Parliament in England too retained independent powers of legislating for our country. Measures which the Government was keen on adopting, but which a majority in the Legislature did not approve, could have easily been passed and put into effect through these agencies, without in any way affecting the constitutional responsibility of the Government of India to the British Parliament. Policies which an Executive carries out on its own responsibility in defiance of public opinion are more strongly resented by the people, at least in the formative stages of their political evolution, than those which seem to have the sanction of a legislature behind them, no matter how it might have been extracted. Naturally therefore our wise Government realised that it would not be in its interest to call into play its special powers every now and then by legislating on its own authority. All the same, the Executive in India wanted to retain absolute control on legislation and the only way open to it, was to bind the official members permanently to its side. The underlying motive which really prompted

the Government of India to set up an 'official bloc' in the Indian Legislature was not so much the constitutional plea of its responsibility to the Home Government as the political expediency of pretending to impress upon, the people in India and in England alike that its measures carried with them the support of the Legislature. The Executive also adopted other arts to secure a majority clinging more or less to its side. Mr. Thakore mentions in his work on Indian Administration that the Executive not only bound the official members of the Legislative Council to support it in the thick and thin but also exercised the power of nomination so as to obtain representatives of the people or any section of them who were considered safe and pliant and its officials manipulated constituencies and elections indirectly in various ways with the same end in view.¹ These ultra-constitutional attempts of the Executive further confirm the view taken here, that it was for political reasons rather than for constitutional ones, that an 'official bloc' was set up in the Indian Legislature.

The Effect (1893-1909)

What was the effect of the creation of an 'official bloc' in the Legislative Council? A 'government party,' so to say, was set up in the Legislature, and being in a permanent majority, it dominated the proceedings of the House and dictated its decisions. In his book on Indian Constitution, Mr. A. R. Aiyengar has well said: "The effect of this state of things is to alter the actual position originally assigned to the Legislative Council in the Constitution, in all cases where the Government has an official majority or a majority which it can create, control or influence."² The few powers which the new Act bestowed upon our members became all the more unreal and ineffective. Finding the official members arranged against them in a compact block which they could scarcely hope to penetrate and realising

¹ Thakore : *Indian Administration*, p. 145.

² A. R. Aiyengar : *The Indian Constitution*, p. 148.

their utter helplessness, having been placed in a permanent minority, the non-official members leaned towards a stronger criticism of the Government and its actions. The spirit of co-operation, which had been manifest up to the year 1892, now gave way to a spirit of opposition. An opposition was thus created in the legislature and the relations between the official and the non-official members, and particularly those between the official and the elected non-official members became far from cordial.

Complaints have sometimes been forthcoming that the non-official members showed a little lack of the sense of responsibility in their opposition and criticism of the Executive. But the blame should not be shelved upon them. For, under the circumstances, when their most potent arguments, which would have easily evoked a favourable response from many an official member, if only the latter had been allowed to exercise an independent discretion, seemed to receive no sympathy or carry any weight with them simply because they were disagreeable to an irresponsible Executive overhead, they could not be expected to offer at all times sober and responsible criticism. The Executive was in the main responsible for such a state of affairs, if it existed, by creating fictitious and unwholesome divisions in the Legislature and by rigidly segregating the official members to form a definite pact. The proceedings of the Council, however, definitely indicate that legislative measures were now debated upon and criticised more efficiently by our members than they had been before and credit must be given to them for the increasing interest they took in the work of the Legislature. On the other hand, so far as official members were concerned, fewer of them took part in the debates in spite of the fact that their number had increased. As a general rule, with the exception of one or occasionally two official members who actively assisted the member-in-charge, the other officials paid practically no heed to the proceedings of the Council. Naturally if the theory was that they should all vote in a body with the members

of the Executive Council, and not according to the views which they hold or the judgment which they may form on listening to the debate, there is no wonder that they paid little attention to the proceedings of the Legislature. It was sufficient for them to pool their strength in the government lobby whenever a division would be called. It has actually been noticed that while the debates were in progress in the House, some of the official members, who were doubtless very busy people, thought it wiser to look to their departmental office work. This was a highly demoralising development and cast an air of unreality over the proceedings of the Council.

Protests were consequently made against the continuance of such a state of affairs both inside the Legislative Council and outside, by non-officials as well as officials. Sir P. M. Mehta and Sir G. Evans condemned the practice in the Council and a distinguished Indian jurist, V. B. Iyengar criticised it in strong terms in a minute which he forwarded to the Government of India in 1908. On the floor of the Council, Sir Evans declared thus : "We should be careful to maintain the position assigned to us in the Constitution and not to abdicate our functions or allow the Executive to make laws when we only register them." Sir Mehta maintained that distinction ought to be drawn between the position of the ordinary official members and the additional official members for the latter had a larger freedom of action. But speaking for the Government, Sir James Westland ruled out such a hypothesis. He definitely pointed out that he could not concede this in respect of Government measures. But it may be well to note that most questions in those days, were Government questions as no private member could move a resolution or even introduce a bill in the Council without the previous sanction of the Governor-General.

The so-called Constitutional Position of Official Members

The significance of the distinct positions assigned to the

official and non-official members in the Legislative Council, was based upon an ultra-constitutional understanding that official members were bound to vote with the Executive. We have already noted that there was no statutory warrant for the growth of such a convention either under the Indian Councils Act or under the rules and regulations made under it. This understanding has therefore repeatedly been regarded as an anomalous growth in the Indian constitution. The position taken by the Government in the matter was, however, as follows. In respect of all legislative measures introduced by the Government, consisting of the Governor-General and his Executive Councillors, either in accordance with the decisions at which they previously arrived, as embodied in the Bill or in pursuance of the instructions and directions of the Secretary of State which they were bound to carry out, the members of the Executive were bound to vote, in either case, in favour of such official measures. In the former case their vote was based upon their own convictions and in the latter it rested upon the mandate of the Secretary of State for India.

Lord Elgin explained, briefly, the position taken by himself and the members of the Executive Council in lending their support to the Cotton Duties Bill in pursuance of the orders of the Secretary of State but against their own previously expressed views, and also, in defiance of public opinion in India. He remarked thus: "So far as the individual action of my colleagues and myself is concerned, Sir Henry Brackenbury, in the discussion on the last Tariff Bill, and again to-day, has said that we are bound to obey the orders given by the proper and constitutional authority. But, for my part, I do not think that exhausts the question. It is claimed that members must be free to speak and vote in the Council for the measure they honestly think best. I can accept that proposition only with the qualification that they duly recognise the responsibility under which they exercise their rights in the Council. Only in an entirely irresponsible

body can members act entirely as their inclination leads them. In every legislative body a man must sit, unless he has an hereditary right, by what in modern parlance is called a mandate, and that mandate is given by some authority.”¹ He further pointed out that even in a Parliament a man was not free to act exactly as he pleases but was subject to the mandate he had received from his constituents or from the party to which he belongs. In the case of our country, he held, the supreme authority was the British Parliament which acted through the Secretary of State and to which alone the Indian Government as well as the Legislature were supposed to be responsible. As early as 1870, the Duke of Argyll had frankly declared that “The Government of India were merely executive officers of the Home Government who hold the ultimate power of requiring the Governor-General to introduce a measure and also of requiring all the official members to vote.”² If the view taken up by the Executive was really as constitutional as it has been made to appear, a provision could well have been inserted to the effect either in the Indian Councils Act or in the Regulations made under it. And why was it that the Government waited for full 22 years before laying down a convention compelling all official members to support it in the Legislature, though it had early obtained the necessary sanction of the Secretary of State? The only feasible reply seems to be that all this bogey of constitutional responsibility was forged up to shade off the political motive that underlay the creation of the official party in 1892 when the new reforms were enacted.

Expansion of Control over Official Members

Additional official members were first nominated in the

¹ *Abstract Proceedings of the Indian Legislative Council*, Dec. 27, 1894, pp. 446-47.

² Secretary of State's Despatch to the Government of India, Nov. 24, 1870.

Indian Legislative Council in 1853, when it was the only Legislature in the country, with the idea of giving representation to provincial interests in the Central Legislature. But although the Provinces came to have their own local legislative councils since 1861, the idea continued to survive that official spokesmen of the Provinces go in the Indian Legislature primarily to represent their interests. Accordingly, when the Budget was thrown open to discussion in 1892, it was a common practice for the provincial members to express their dissatisfaction with the funds placed at the disposal of their respective Administrations and they would not hesitate to criticise the Government on that score. They openly advocated, in opposition to the wishes of the Indian Government, for a substantial increase in the share of revenue assigned to the local Governments. Although, since 1892, it made it incumbent upon every official member of the Legislature to support it, the Government of India continued to tolerate their criticisms of its financial policy till the promulgation of the Morley-Minto Reforms of 1909, when it definitely declared that the Government was no longer prepared to tolerate even such criticisms at the hands of the additional official members. Thus the Government removed the last remaining point of distinction between the ordinary and additional official members of the Council and placed them in the same category so far as the proceedings and functions of the Legislature were concerned.

The strong line of action taken by the Government of India came as a great surprise to many of the provincial spokesmen. They raised a protest as the little freedom which they had been allowed to enjoy, was also snatched away from them. But the Government of Lord Hardinge was determined in the matter and he emphatically declared that the Reforms of 1909 had entirely changed the position. Their official majority, he explained, had been reduced to its lowest practicable limits and therefore the provincial officials should no longer be regarded

as sitting in the Indian Legislative Council to speak for their provinces but to support the Government of India alike in matters of legislation and finance. From the point of the Government, he added, the Indian Legislature could no more be regarded as a place for the discussion of the differences existing between the Central and Local Governments.

Such a ruling led some of the provincial official members to put forth their demands on the plea that they had behind them the support of the non-official members of their provincial legislatures. The joint authors of the Montague-Chelmsford Report, therefore, rightly came to the conclusion that "in pleading for better financial terms for their presidencies the Madras and Bombay official representatives were expressing the views, not merely of the Provincial Governments, but of the elected members of their provincial councils" and remarked that "under the Morley-Minto Scheme official indulgence of the popular view may easily find itself in conflict with the official discipline."¹ Misgivings of this nature, in fact, urged the Government of India to further tighten its control over the official members. Such a conflict of discipline actually occurred in 1912. The representatives of the Bombay Government moved to the Central Executive to sanction certain alterations in the Budget relating to educational staff of the Presidency but the latter was not prepared to accept their suggestions. Public opinion in the Presidency had been consistently asking for these alterations, and the demand was put forward in the form of a resolution by an elected member in the Local Legislature and the Government accepted it. Thereupon, the official representatives of the Presidency once again submitted their proposals to the Central Government on the ground that they had the unanimous support of the Local Legislature, but the Government and the Secretary of State were both adamant and

¹ *Montague-Chelmsford Report*, Para 89.

maintained that these tactics were out of order and would be of no avail.

The remarks made by Lord Crewe, the Secretary of State, in this connection are full of meaning as indicating the real intentions of the Executive. He said: "The Government of India have no representation on a provincial council, and the defence of their policy and orders in matters of provincial administration, as well as that of any that may have been laid down by the Secretary of State, is wholly entrusted in these assemblies to the Local Government. Therefore for reasons similar to those for which Your Excellency's Government in the Imperial Council are careful to preserve your solidarity with the Secretary of State, it is incumbent on a provincial Government in the conduct of the business of its Legislative Council to avoid disclosing a difference of opinion in an administrative matter between the Imperial and Provincial Governments, and doing anything to foster the impression that there may be opposition between the constitutional responsibilities of these Governments when no such opposition either does or can exist. There is for India one system of administration and one alone..." On such grounds as these Lord Crewe thought that it was the duty of the Government of Bombay to have upheld the decision of the Government of India in regard to the resolution cited above and that accordingly it should not have brought forward the proposal a second time before the Central Legislature. It is a pity, indeed, that the Secretary of State for India impressed upon the Provincial Governments the necessity of throwing dust into the eyes of our representatives in the Councils by not disclosing the differences that have existed and continue to exist between them and the Government of India. The statement of the Secretary of State implicitly declared that not only were the official members in the Central Legislature required to act together according to the behests of a strong Central Executive but even the official members

in the Local Legislatures had to prove their fidelity, not only to their immediate superiors, but also to their more distant masters at the Centre by faithfully carrying out their policies and upholding their views. All officials, whether in the Central Legislature or the Provincial, had to serve but one master and to play upon the tune set by the Government of India. The tree had begun to shoot its branches in all directions; having grown up quietly at the Centre it was spreading all over the country. Fully consolidated at the Head Quarters, the 'official bloc' opened its agencies at the Provincial capitals and soon the organisation of the Government party was complete.

The 'official bloc' under Morley-Minto Reforms (1910-20)

Thus, instead of lifting the ban placed on the freedom of the official members in the Legislature in view of the numerous protests which had been made against the system, the Government of India further tightened its hold on them by disallowing them the little liberty of expression they still enjoyed in matters of finance, as soon as the Morley-Minto Reforms were put into force in 1910. The new Reforms enlarged the Legislative Council and expanded its functions. The principle of election was for the first time given a statutory recognition and the membership of the Council was raised to 68. Special representation was given to Mahomedans, Europeans, landholders and commercial interests, and an official majority of 4 was retained in the Indian Legislature though it was dispensed with in Provincial Legislatures. Members of the Legislature were now allowed to move resolutions both on matters of general public interest and on the Financial Statement, and to call for a division. The right of asking supplementary question was also conceded. The statutory composition of the Legislative Council was as follows, the actual yearly variation in the respective numbers of officials and non-officials is noted in the table attached hereafter:

Members of the Governor-General's Executive Council.....	8
Officials nominated by the Governor-General.....	28
Non-officials nominated by the Governor General.....	5
Non-officials elected by various Constituencies, Special and General.....	27

The following table shows the strength of the 'official bloc' in the Indian Legislative Council from 1910 to 1920 and its composition

Year	Non-officials		Officials		Total
	Elected	Nominated	Central Government	Provincial Governments	
1910	25	7	26	10	68
1911	25	7	26	10	68
1912	27	5	26	10	68
1913	27	5	25	10	67
1914	27	4	25	10	66
1915	27	4	23	8	62
1916	27	4	25	9	65
1917	27	5	26	10	68
1918	27	5	25	10	67
1919	27	5	26	9	67
1920	27	5	26	9	67

Though the Legislative Council was enlarged and its powers were increased, the old idea that legislative councils in India are merely the Governments in their legislative aspect survived in the Government of India Act of 1909, Sec. 63 (i) of which reads thus: "For purposes of legislation the Governor-General's Council shall consist of the members of his executive council with the addition of members nominated or elected in accordance

with rules made under this Act.”¹ The persistence of this idea was, according to the views taken in the Montague-Chelmsford Report, the main reason why the official bloc was maintained under the Morley-Minto Reforms, with peculiar rigidity. Its joint-authors have remarked that “Non-official members have long since enjoyed the right of introducing legislation ; but the view that law-making was still primarily the prerogative of the executive government which is amenable to Parliament has so far endured that it has been the exception and not the rule for Government to leave its official members free to speak and vote as they choose even on private members’ business.”² But a deeper motive was at work beneath this seemingly plausible notion that the ‘official bloc’ continued to be maintained in the Legislative Council merely because the Act still regarded the Legislature as part of the Government. Legislatures are in every country, under every constitution, howsoever democratic, a part of the Government of the country, unless we restrict the meaning of the term ‘Government’ to denote the Executive alone as has unfortunately been the case in our country. The new reforms had given our members the power of moving resolutions and the more important right of dividing the Council upon them. With a standing official majority of only 4 in the Legislative Council, the Government apprehended that if they released their hold upon the votes of officials, some of them would occasionally be won over by non-official members, in the course of the debate, leaving it in a minority. If this contingency arose frequently, the Government would find it difficult, in spite of some support which it might obtain from the non-official ranks, to push through the Legislature some of its proposals, disapproved by the non-officials, and to defeat those brought forward by them but disapproved by it. The occurrence of such a situation could be avoided if the Government

¹ Government of India Act, 1909, Sec. 63 (i).

² *Montague-Chelmsford Report*, Para 85.

advanced proposals which were considered as reasonable, convincing and just by a majority in the House, but it doubted its own powers. No doubt, resolutions, even if they were passed against the wishes of the Government could not force it to give effect to the demands made in them as they had merely a recommendatory character. Yet, if a good many resolutions were recorded in the Council in opposition to the policy and intentions of the Executive with the support of some of its official members, the Government would be placed under a moral obligation to take action on them. The Government was not willing to place herself under any such obligation for the simple reason that it did not want to release its firm hold, howsoever slightly, on the legislation of the country and on its own policies. Consequently, it preferred the quiet but unfailing support of the officials under its control.

The argument put forth by Lord Morley in favour of retaining an official majority in the Central Legislature also gave a hint to the Government of India for maintaining the 'official bloc' which it had set up in 1892. He declared: "While I desire to liberalise as far as possible the Provincial Administration I recognise it an essential condition of the policy that Imperial supremacy shall in no way be compromised. I must, therefore, regard it as essential that Your Excellency's Council, in its legislative as well as its executive character, should continue to be so constituted as to ensure its constant and uninterrupted power to fulfil the constitutional obligations that it owes and must always owe to His Majesty's Government and to the Parliament... To secure the required relations I am convinced that a permanent official majority is absolutely necessary."¹ Once the proposition was laid down that a standing official

¹ Secretary of State's Reforms Despatch to the Government of India, Nov. 27, 1908. (P. Mukerji : *Indian Constitution Documents*, Vol. I, p. 319).

majority was absolutely necessary, it followed as a matter of course from it—at least the Government thought so—that the Government should see to it that this majority steadily and permanently clung fast to it and acted strictly in response to its orders and intentions.

It cannot be gainsaid that some of the official members would have supported certain non-official measures and entered the lobby against the Government if they possessed the liberty to do so. An incident which occurred in 1913 throws much light on this matter. Public men, in our country, had been demanding the separation of judicial and executive functions in the administration of justice. In 1908, Sir Harvey Adamson, the Home Member, eventually declared in the Imperial Legislative Council that the Government had definitely made up its mind to introduce the reform, though, he made it clear, that the Government proposed to move very cautiously in the matter. But, as nothing was practically done in the direction of separating the judicial and executive functions during the next five years, Mr. Surendra Nath Banerji moved a resolution in February 1913, reiterating the demand. Yet in spite of the unanimous support of the non-official members, it was bluntly rejected by the Government. However, an important fact has been recorded by Mr. Banerji in his book 'A Nation in Making' that Sir Fleetwood Wilson, who presided on the occasion of the absence of the Governor-General came up to him where he sat and said: "Mr. Banerji, if I had two votes, an official and a personal one, I should have given the personal vote in your favour."¹ It is a sufficient proof of the correctness of the statement that it has never been contradicted. Such instances indicating a conflict between official discipline and individual conscience, which must have raged in the minds of a good many official members, may be multiplied if the records which

¹ S. N. Banerji : *A Nation in Making*, pp. 293-94.

lie in the archives of the Government are made available for purposes of research.

*Control exercised by the 'official-bloc' over
the proceedings of the Legislature*

How effectively the Executive employed its permanent majority to overcome opposition, and to thwart public opinion can be easily realised on looking up the proceedings of the Legislature. Such measures, among others, as the Press Bill of 1910, the Continuation Bill of 1911, the Indian Tariff Bill of 1911, the Indian Criminal Law Amendment Bill of 1913, the Indian Income Tax Amendment Bill of 1918, the Criminal Law Emergency Powers Bill of 1918 and the Indian Criminal Law Amendment Bill of 1919, were passed by the Legislature in the face of strong and concerted non-official opposition and all amendments proposed on them by our members were rejected by the Executive with the help of its official majority. Of about 200 resolutions which were moved in the Council by the non-official members during the eleven years, 1910-1920, only 30 were acceptable to the Government, most of them being accepted only after they had been amended to conform, more or less, to its wishes, while some of them were merely of a formal nature. Over 50 per cent of the resolutions were rejected while a large proportion of those withdrawn were dropped because the Government was frankly hostile to them. All proposals made by our members, to which the Executive was opposed, had absolutely no chance of success in the House. Among a host of others, the Government conveniently rejected the following commendable resolutions, in spite of the great support they evoked from the non-official benches, simply because the Executive did not favour them. These resolutions demanded the reduction of the working expenses of railways which had been mounting steadily in spite of repeated protests in the Council (1910 and 1915); the abolition of the Cotton Excise Duty (1911); the holding

of a substantial portion of the Gold Reserve in India (1911); the increase of import duty on sugar in order to afford some protection against foreign competition to Indian sugar industry (1911 and 1913); the separation of judicial and executive functions (1913); the state management of railways (1915); the retention of the rate of salt tax at Re. 1 per maund, which it was proposed to increase by 4 as. a maund (1915); the investigation of the causes of Indian anarchism (1917); the adoption of a scheme of compulsory free education (1917 and 1918); the acceptance of a policy of total prohibition with a view to check the growing evil of intemperance (1918); the appointment of Indian members for representing the country at the Imperial Conference on the recommendation of the elected members of the Legislative Council (1918); the raising of the grants made under the head Scientific and Miscellaneous Departments by 50 lacs in order that effect may be given to the recommendations of the Industrial Commission (1919). Numerous resolutions were moved from year to year asking the Government to spend larger sums on Education and Sanitation and to provide larger funds for the development of irrigation; but practically all of them were rejected, though later on the Government showed some inclination to move in these directions when it could spare funds for such nation-building objects. The Government also voted down two very reasonable resolutions, couched in the most moderate terms, which Sir Srinivasa Sastri introduced in 1918 on the subject of Indianisation of services. The first one proposed to the Government to recommend to the Secretary of State that the recruitment for the Public Works Department and the Railway Engineering Services, excepting of course, the proportion of seats reserved for Royal Engineers, be made within a reasonable period of time wholly in India. The second recommended, (a) that immediate steps be taken to ensure that Indians were appointed to the great majority of posts recruited in India and (b) that the educational

qualifications prescribed for admission into these services should be sufficiently high and the same for all candidates irrespective of their creed or race. It is thus clear that the control exercised by the 'official bloc' in the Indian Legislature during the period 1910-1920 was perfect. No proposal, howsoever good, could be adopted by the House against its wishes, while it could carry any measure which it chose in spite of unanimous opposition at the hands of non-official members.

Control of the Executive over the 'official bloc'

The Government succeeded in dominating the proceedings of the Legislative Council to such a remarkable extent obviously because of the effective control which they maintained over the official members. We have already seen that they were bound to support the Executive and to vote for it irrespective of their personal opinion and regardless of the merits of any question. They were denied the right to put questions or to move resolutions, and in some cases, they were not allowed even to intervene in the debate except with the previous approval of the Government. In financial matters too, the official members were no more permitted to uphold the views of their Provincial Administrations if they happened to be opposed to the views of the Central Government as expressed in the Financial Statements. Or what is known as 'government business' the control of the Executive over the official members was still more profound. The view taken in the Montague-Chelmsford Report that there was, of late, a tendency to treat more matters as open questions¹ is not verified by the proceedings of the Legislative Council. For, during the whole of the period, the official members were never, except on one occasion in 1918, explicitly given a free hand and there is no single recorded instance when an official cast his vote against the Government. And

¹ *Montague-Chelmsford Report*, Para 85.

what was the kind of resolution on which, for once, the Government permitted an open vote in the Legislature? On the 5th of March, 1918, Sir Srinivasa Sastri put forward a resolution that the Secretary of State be requested to include certain subjects such as Indian History, Persian, Arabic and Sanskrit among subjects for the Indian Civil Service competitive examination. Speaking for the Government, Sir James Du Boulay generously remarked: "Government consider that the question be left to an open vote, official members being at liberty to speak and vote as they please." Firstly, neither the resolution involved any important matter of policy nor did it raise any controversial issue; it merely concerned a few of the small number of our countrymen going for the Civil Service Examination, held in England. Secondly, the wording of the resolution was quite non-committal; its acceptance would in no way have bound the Government of India to any definite line of action as it contained a simple recommendation for requesting the Secretary of State to consider the proposal, who could easily have dropped the matter if he did not approve of it. Thirdly, it is all the more interesting to know the fact that the officials were allowed a free hand in the matter after the Government had practically accepted the substance of the resolution by promising to communicate the views of the Legislature on this topic to the Secretary of State in due course. Consequently, the concession which the Government made to the official members was as unreal as insignificant. Beyond this solitary instance, the official members were never allowed the fundamental privileges of free discussion and open vote, granted to every member in a legislature, even on resolutions which were accepted by the Government. The natural inference, therefore, is that there was no relaxation in the control exercised by the Executive on official members in the latter years of the period 1910-20.

¹ *Government Gazette of India*, March 5, 1918, Pt. VI.

Effect on Official Members

The continuance of the system which made the officials speak and vote at the bidding of the Executive, while it deprived them of their privileges as members of a legislature, greatly facilitated their task in the Council. In the case of Government measures, which were adequately supported by the member-in-charge, they had very little to do except to record their votes for them when the time came. In those matters alone which seriously concerned his Department, Central or Local, would an official member support the Mover by a short speech. Nor were the officials destined to play any significant part in the discussion on private business. After a resolution or a private Bill had been moved and supported by a few non-official members, one of the members of the Executive generally explained the attitude of the Government in the matter. When the position of the Executive had once been indicated in the House official members had only to bow down to it, and to applaud it by arguments they could find in its support. Yet, on many an occasion, they remained quiet waiting for a division to be called. Only when some controversial matters or important questions of policy were being debated that just one or two of them opened their lips to endorse the remarks made by their colleague on the Executive and to repeat their arguments. Therefore, the part assigned to official members in the Legislature was by no means very significant though, doubtless they performed the very important duty of registering their votes for the Administration. The Government evidently cared for their votes, and having secured them once for all, it would not bother itself whether they played their due part in the debates or not.

'Official bloc' and party discipline

The comparison which has sometimes been made between

the mandate of the Indian Government over official members in our Legislature and the rigidity of party discipline in the House of Commons in England is wide off the mark and does not stand to reason. The reason which leads a member to acquiesce in the party leader's bidding is the perception that the defeat of the Government (which means his own party) would mean a change of ministry, and therefore he is naturally prepared to sacrifice his personal opinions on a particular issue for the larger principles for which his party stands. But even there occasions do arise when personal views of the members assert themselves and Governments have fallen because some of their own party went against them. The essence of the British system is political responsibility to the legislature in the first instance and to the electorate ultimately. But the case in India has been very different. The official obligation to vote in an Indian Legislative Council was not of their own choosing as in the case of the party in England, but is based on authority from above and as such is not made palatable by any necessity of securing an irremovable executive from demise. The Indian Government is irresponsible alike to the people and their representatives in the Legislature and cannot be removed by them ; it is responsible to higher authorities in England. Accordingly, the position which binds official members to the Government in India is not the same as that which prompts the party members to adhere to the views of their leader. The one is authoritatively forced upon a set of people ; the other is a voluntary creation. Mr. Iyengar aptly remarks that "while in the case of members of Parliament, the submission to the party whip is purely voluntary and based on principles of party government and the alteration of party politics, the voting order of official members in the Indian Legislative Councils is based upon the official authority exercised by a superior over a subordinate in the public service, which virtually gives power to the former to materially alter

the legal character and position of the Legislative Councils and their members.”¹

Effect on Non-official Members

We have already noticed earlier how the creation of the so-called ‘official bloc’ led to the formation of artificial and antagonistic divisions in the Imperial Legislative Council. Its continued existence after the Reforms of 1909 further embittered the relations between the official and non-official members of the Legislature. The invidious distinction, which the convention regarding the ‘official bloc’ perpetuated by assigning a permanent weightage to the official members over the work of the Council, was keenly felt by our members. It was, no doubt, highly irritating and disappointing to them to find decisions being repeatedly recorded against their unanimous stand and regardless of the merits of the questions merely at a hint from the Government. Naturally, they felt that the privileges which had been offered to them under the new Reforms were thus rendered quite ineffective and unreal. Their existence in the Legislature seemed to them to be of little consequence. Even Malik Umar Hayat Khan, who so often found it convenient to side with the officials resented such a procedure and made bold to declare in the Council: “Now there is one very serious thing which is felt by many a non-official heart, and that is that our existence here has very little difference. I think the cause of it is the pre-arrangement of what is to be done; and when a man is urging and making a speech he thinks that he is talking to a wall and his best arguments would not have the least effect. The other cause has been, I think, the wholesale refusal of good and bad amendments. I think this can be easily remedied. If the non-official members were near the mark and by accepting their suggestions no injury done to the administrative machinery, then I think suggestions should be accepted. This will

¹ A. R. Iyengar : *The Indian Constitution*, p. 149.

go a long way to show that we are not only part and parcel of the Government, but are of some use to them.”¹ The Government knew best the use to which such suggestions were to be put and it is no wonder that it paid no heed to the matter.

Public opinion, both inside the legislature and outside it, had been up against such a system; the Government was also alive to the evils which it had been perpetuating. Yet the pitiable part of it is that it was not willing to do anything substantial to rectify the situation. It was not until the year 1918 that His Excellency, the President drew the attention of the Council on March 22, to a practice which the Government inaugurated during that year of official members taking a larger share in the debates and the proceedings of the Council. Expressing his regret that this practice had not been adopted earlier, he recognised officially for the first time that “From the point of view of the Government of India, it is undoubtedly a waste of manpower and brain capacity that we should place a number of distinguished officials on the Imperial Council and refuse them to avail ourselves of the knowledge and experience in our debates.”² In the same speech His Excellency recognised publicly the evils which had attended the maintenance of an unimpeachable and invulnerable official bloc by alluding to the disaffection of the non-official members with the remarks: “It is a constant source of irritation to the official members that they are up against a silent phalanx of votes. Much of this soreness would, I feel sure, be removed if non-official members were able to cross words with official members on the floor of the Council Chamber, if they found that they had to deal with men of flesh and blood of like passions with themselves, and not silent voting automata finding their way with machine-like precision and unfailing accuracy into the Government Lobby.”³ No sooner

¹ *Gazette of India*, April 12, 1913, Pt. VI, p. 447.

² *Gazette of India*, March 30, 1918, Pt. VI, pp. 719-20.

³ *Ibid.*

had he expressed the desirability of official members taking a greater share in the debates of the Council that the phantom of safeguards began to haunt the Head of our Administration and he hastened to remind the Council that the Government must have power to carry its legislative purposes and inasmuch as legislation is carried by votes, it cannot relinquish its hold on the official vote."¹ It was meaningless to ask the official members to take greater part in the debates unless they were given the liberty to speak according to their personal judgment and the power to act up to it. It would have been most ridiculous for an official member to speak in the debates according to his individual judgment as long as he was denied the corresponding right to exercise the same freely in voting. No official could regard it in keeping with his position to support non-official views because he favoured them so long as his vote was pledged for the Executive. After all, the nominated official members were servants of the Imperial Government, and until the latter was definitely prepared to relax its authority over them, in so far as their work in the Legislature was concerned, they would scarcely utter anything in debate which was likely to prejudice its viewpoint. Therefore, if the official members took a slightly greater part in the proceedings of the Legislative Council and intercepted in the debates more often since 1918, it hardly yet implied that they ever spoke their own mind or gave an impartial and unbiased consideration to the proposals and suggestions put forth by their non-official colleagues. On the other hand, it only meant that while so far scarcely one or two official members ever spoke for the executive, henceforward, a larger number would take part in the debates to harp upon the note sounded by their Imperial masters. Our members accordingly continued to deal with men who were not of 'like passions with themselves,' for though they

¹ *Gazette of India*, March 30, 1918, Pt. VI, p. 720.

opened their lips more frequently, they did so not on an urge from within as on the wire-pulling from above. No more dummies of earlier years, they continued to behave as 'voting automata'. The modification proposed by the Governor-General was illusory and it failed to affect any improvement in the relations of the official and non-official members or to allay the irritation caused to the latter by working under a system which rendered their presence in the Legislature nugatory.

The bitterness of our members continued to grow when they consistently found that their "views are rarely placed on record as the opinion of the Council, because the decision is in a majority of cases the decision of the Government."¹ The fact that there were only two Indian officials in the Council and that the few non-official European members as a rule voted with the Government aggravated the differences between the official and non-official benches. The cleavage between them took a racial turn and the debates suggest a growing tendency towards the discussion of racial questions or of questions being discussed with a bit of racial bias. Such a baneful tendency particularly manifested itself during the debates on such matters as Indianisation and prospects of the Services, the tariff and the repressive policies of the Government. The 'opposition' took a stronger tone, and the helplessness of their position occasionally inclined our members to round up their mutual differences as far as possible and to press their points of view before the Government as solidly as they could. But the very constitution of the Imperial Legislature rendered the formation of an effective league against the Government quite impossible. For, the non-officials were placed in a permanent minority, and they went into the Council not as representatives of the people as such but as nominees of various sectional and communal interests. Moreover, a number of non-official members were directly nominated

¹ *Montague-Chelmsford Report*, Para. 87.

by the Government and they very often felt morally bound to lend their support to the authority to which they owed their position in the Legislature. An organised opposition to the Government was therefore, out of the question.

Effect on the Proceedings of the Council

All these factors combined to give to the proceedings of the Legislature an air of unreality. This consequence was quite natural as it was not the arguments propounded and the opinions expressed in it which mattered but it was the quiet unostentatious recording of votes that led the day in the Council. The elected members being placed in the position of an ineffective minority, the official members taking little share in the proceedings and the issue in most cases being known beforehand, the debates were occasionally lifeless. The debates grew lively and reached a high standard on those few matters, which affected certain interests more or less directly, or those important matters of policy on which feelings were strong. Credit should be given to most of our members who, while chafing under a position of helplessness, exhibited a fine composure throughout and continued to deal with matters taken up in the Council with increasing efficiency. The little lack of responsibility which appeared in some of the discussions was due to the fact that non-official members had practically no say in the decisions of the House and no responsibility even in the legislation of their country. "Sober and well-considered constructive advice," as Horne has remarked, "is likely to be offered by those who are, partially at least, responsible for the results which follow from adopting such advice and acting upon it...Advice uninformed with responsibility, is usually marred by the evident desire of the critic to embarrass and to find fault rather than to be helpful and to cooperate."¹ In spite of all this, our members

¹ E. A. Horne : *Political System of British India*, pp. 60-61.

tried their best, under the circumstances, to be helpful in the administration of the country and on a good many occasions cooperated with the Government, but the latter still regarded them with doubt and suspicion, turned down their overtures, and in no way relaxed their control over the official members. The increasing efficiency and the sense of responsibility which our members brought to bear upon the proceedings of the Council have been highly spoken of by the various Governor-Generals in the course of their speeches delivered in the Legislature.

The presence of an invincible official majority not only affected the tone of the debates but also materially altered the work of the Council. The most important work of legislation, came to be performed in the Select Committees and in the Council itself there was very little of legislative work. For, non-official opinion was invited before the introduction of a Bill and whatever little chance it had of influencing the measure ended for the most part with its introduction in the Legislature. There was a little give and take, no doubt, in minor matters but in respect of all important provisions there was little chance of amendment in conformity to non-official views after the Bill was received back from the Select Committee. The real constructive work of legislation was thus largely done either in the Select Committee or behind the scenes by correspondence. The Council so often recorded the decisions which were arrived at earlier and elsewhere by the Executive. The fact of official supremacy in the Legislature also accounts for the dearth of private legislation during the period. It has been responsible for the greater interest shown by our members in resolutions than in legislation. The carrying of a resolution, against the Government, though far from being possible, came to be regarded as a great moral victory besides affording the opportunity of recording an opinion which might bear fruit some day. Their resolutions, no doubt, were easily voted down, but they were

the only important means which they could employ to draw the attention of the Government to the needs and grievances of the people and to criticise its policy.

Effect on public opinion

The effect which the working of the 'official bloc' had on the trend of public opinion in the country is not, therefore, difficult to trace. When the Morley-Minto Reforms were launched, our public men thought that in the new councils, with larger elected elements and the larger powers offered to the members, they would be able to take some share in the administration of the country, to influence the policy of the Government in certain directions and to succeed ultimately in redressing the standing grievances of the people. The working of the new reforms soon made it plain that the Executive was not prepared to relax its hold over the affairs of the country and the presence of a solid phalanx of officials in the Legislature rendered the proceedings of the Councils illusory. The Councils were found to be very ineffective, and the satisfaction with which the Reforms were hailed soon gave rise to disappointment and fresh agitation. In the meantime national consciousness had been steadily developing in the country and the desire for a real share in the political power had been rapidly growing in the minds of our educated countrymen. The Councils with their limited opportunities and no substantial powers were regarded as an insufficient safety-valve. "While therefore inside the Councils there are signs of hardening opposition and the weariness which comes of sterile efforts," says Archibold, "outside the Councils the tide of feeling was rising more quickly."¹ Agitation was started in the country, even before the outbreak of the Great War, for a fresh instalment of reforms which would give the Councils real and effective powers of influencing the

¹ Archibold : *Outlines of Indian Constitutional History*, p. 166.

policy of the Executive, and a definite share in the administration of the country. The demand for 'Home Rule' began to be made on all sides before the War was over and a number of schemes for constitutional reforms were drawn up and laid before the Government as embodying the demands of our people. The Indian National Congress, which had so far included all shades of politicians in its fold, began to exhibit a preponderance of radical elements and took an extremist turn during the last two years of the period, 1910-20, and this subsequently led to the cessation of moderate elements.

The Official bloc under the Montague-Chelmsford Reforms
(1921-34)

In his famous declaration of 1917 the Secretary of State for India recognised for the first time that the "goal of British policy in India was the progressive realisation of self-government."¹ The Government of India Act embodying the scheme of new reforms was passed in 1920, and needless to say, that they failed to satisfy the advanced section of our public men represented in the Congress. What concerns us here, however, is that the Indian Legislature now came to be composed of two Houses, the Council of State and the Legislative Assembly. Official majority was dispensed with in both the Houses. The former was composed of 60 members, 33 of whom were elected and the rest nominated. Of the nominated members not more than 20 could be officials, and in actual practice, the Viceroy refrained from nominating the full quota of officials allowed under the Act by nominating non-officials in their place. The Legislative Assembly was composed of 145 members, of whom 104 were elected and the rest nominated by the Viceroy. Of the nominated members 26 were officials, one nominated as a result

¹ Announcement of Rt. Hon. Montague, Secretary of State, in the House of Commons on August 20, 1917. (P. Mukerji: *Indian Constitutional Documents*, Vol. I, p. 474).

of election held in Berar and the rest non-officials. The powers of the Legislature were enlarged but the responsibility of the Indian Government to the British Parliament was kept in tact and the Indian Legislature continued to function, as it had hitherto done, as a non-sovereign law-making body to which the Executive owed no responsibility. The postulates in regard to the constitution of our new Legislature were, firstly, that there ought to be a substantial elective majority in the Legislature, and this was really so in the case of the popular Chamber, namely, the Legislative Assembly, and secondly, that the Legislature must not be placed in a position to withhold such funds and to obstruct such laws as the Governor-General in Council should consider essential for the discharge of his responsibility to Parliament. The Governor-General was therefore permitted to retain the power of authorisation, certification and disallowance and of issuing ordinances. With the same end in view, though a small elective majority was provided in the Upper Chamber, viz., the Council of State, care was taken to see that the forces that make for conservatism are far stronger in it than in the Assembly and in most cases the powers of the Upper House were made to be coordinate with those of the Popular House.

*Reasons for the continuance of the Convention in regard
to official members*

In view of the facts that the Montague Chelmsford Reforms were to mark the first stage towards the goal of 'progressive realisation of self-government,' and that the Legislative Assembly was to contain a substantial elective majority, and above all, in consideration of the numerous evils which had been associated with it, it was naturally expected that the convention which had so far bound the official members in the Legislature to an unflinching obedience to the wishes of the Executive would be tolerated no longer. The Montague-Chelmsford Report

attached no little importance to their proposal that "official members of the Assembly, other than members of the Executive Government, should be allowed a free right of speech and vote, except when the Government decides that their support is necessary" and held that "we think this change of procedure will effect the tone of discussions very beneficially."¹ But the political insight of the Government of India ruled it otherwise and the official group of 26 members continued to take orders from it as before. It may well be asked as to why the Executive bound the official members to support and vote for it when they were already in a small minority in the Assembly. Evidently, they could no more sweep the decisions of the Assembly with their solid votes, but they could even now attract certain elements in the Chamber to their side if only they presented a compact and united front on behalf of the Government. The Assembly was not constituted on any uniform, popular or direct basis; a considerable proportion of its members came as representatives of various sections and communities on a separate ticket such as, the Mahomedans, the Sikhs, the Europeans, the landholders and commercial interests both European and Indian. Moreover, 14 of the non-official members were directly nominated by the Viceroy. Obviously it was impossible for such heterogeneous elements of the Assembly to act together and the Government of India rightly thought that a solid block of votes cast for it would on many an occasion have a decisive effect in its favour on the verdict of the House and would rally to its camp certain forces which might well have hesitated to do so had the Government party been found to be divided among itself. It is frankly stated in para. 251 of the statutory Commission's Report that "The influence of this element (official bloc) has been exerted in more ways than one. A solid bloc of official votes cast definitely for Government has only had on many occasions

¹ *Montague Chelmsford Report*, Para. 275.

a decisive effect on divisions in the two Houses, but it has often helped to rally to the support of Government elements which would have hesitated to support a cause which had not the strong nucleus of supporters afforded by the officials,"¹ This statement may be verified from some illustrations noted hereafter. These were the reasons which prompted the Government of India to retain a rigid control over the official members of the new Legislature.

Confronted with a non-official majority in both the Houses the Executive resorted to the practice of winning over certain minority groups to their side and of forming combinations and pacts with them in order to secure, occasionally, a working majority in favour of their policy and proposals. In the Council of State the Government could safely claim a majority with the large proportion of nominated members and the conservative elements which predominated in it offered a hearty cooperation to official benches. The need for mustering up the scattered elements likely to combine with it was therefore greater in the Legislative Assembly. The compact European group of 9 members, as we shall see, generally always supported the Government, and the Central Moslem group so often showed an inclination to throw its weight on the side of the Government. On numerous occasions nominated non-officials also sided with the Government. Besides these more or less permanent supporters of the Government there were a few others such as landholders and commercial magnates who preferred to support it, particularly in matters in which their interests seemed to be at variance with the popular view, and likely to be fostered and safeguarded by the policy of the Government. Consequently, with the rallied support of such elements, the Executive was successful in carrying many a division in its favour in the Legislative Assembly which never contained more

¹ *Statutory Commission's Report*, Para 251.

than 26 or 27 officials. And, even on the occasions when it lost, the Executive was generally able to secure over 40 votes to its side, which shows that not only the European members but also some other non-official members clung steadfastly to the official point of view.

Its actual influence and working

Before examining a few instances as illustrating the influence wielded by the 'official bloc' in the post-reform period it would be desirable to note briefly the complexion of various Assemblies. During its first term, 1921-23, the Liberals, whose policy was to work the reforms for what they meant and to carry on constitutional agitation, predominated in the Assembly. The Swarajists, who subsequently formed a strong opposition party in the Assembly, boycotted the first elections, for, being wholly dissatisfied with the Montague-Chelmsford Reforms, the Congress had decided against entry into the legislatures and started the Civil Disobedience Movement. However, they contested the next two elections and captured 45 and 40 seats respectively during the terms 1924-26 and 1927-30, mostly at the expense of the Liberals. The Swarajists had entered the Legislature with the avowed object of wrecking the constitution, but gradually they modified their extremism by offering constitutional opposition. During their stay in the Assembly, they occasionally combined with the Independent and Nationalist groups and formed a strong opposition, whose approximate strength may be placed at about 70. But when the Civil Disobedience movement was again started in 1930 most of them resigned their seats and refrained from contesting the elections held late in the same year. Consequently, their party was not represented in the Legislature during the term 1931-34, in which the Nationalists and Independents, men who preferred constitutional agitation and constructive opposition, commanded a large proportion of seats.

Now we may take up some concrete instances in which the Executive could command majorities in the Assembly. One of the early successes of the Government came in 1922, when a resolution moved in the Assembly by M. Iswar Saran, for immediate abandonment of repressive policy, was defeated. In the very interesting debate which took place, the opponents of the repressive policy based their contention on the belief that it was merely aggravating the critical condition of the country by supplying fuel to the flames of non-cooperation. On the other hand, the Government emphasised the difference between constitutional and unconstitutional agitation and maintained that if Government, to combat those outlaws who were at war with it, had adopted certain measures, they could not be pilloried as repressive. The majority of the House, which consisted of Liberals, voted with the Government. Another notable victory was achieved by the Executive in the same year on a non-official resolution for the reduction of Provincial contribution to the Central Exchequer. This resolution was rejected by the House, not because a majority disapproved of it—they rather favoured the principle underlying it—but because of differences which arose between non-official representatives of the various provinces. The Treasury Benches and their usual supporters, however, did not favour even the policy contained in the resolution.

A little later in 1925, a motion put forward by Mr. V. J. Patel, one of the leading Swarajist members, designed to deprive Americans and Colonials of their existing privileges in respect of criminal trials encountered a curious fate. On the motion of an elected European member, Sir D'Acry, its consideration was adjourned sine die by 44 votes to 42. The attitude taken up by the Government that retaliation of such a kind was neither wise nor honourable, found support even among certain members of the Independent group and consequently the Swarajist resolution was practically rejected. It is an instance

in which the Independents, whose policy was to carry on constitutional opposition, and who generally joined their forces with the Swarajists, were found in the Government lobby. Another such instance occurred in the same session. When the Railway Budget was introduced the Swarajists invited the Independent party either to join them in throwing it out as a political protest or failing this, to reject the demand relating to the Railway Board, whose constitution and powers, had long been a subject of criticism. The Independents did not see eye to eye with the Swarajists in the matter. After a lively debate Pt. Moti Lal Nehru's motion for rejecting the demand for the Railway Board was lost by 66 votes against 41, the Independents voting with the Government. When the Finance Bill came up for consideration later on in the same session, the Swarajists opposed its consideration on the ground that the Government continuously flouted public opinion. And while the Independents, led by Mr. Jinnah, frankly commented upon the shortcomings of the Government, they were unwilling to join the Swarajists on the rejection of the Finance Bill which was accordingly taken up for consideration by 76 votes to 40.

An important victory was won by the Government over the Currency Bill of 1927 which gave rise to keen controversy. The discussion chiefly centered round the rupee-sterling ratio. The Finance Member, Sir Basil Blacket put forward the case for stabilising the rupee at 1s. 6d., maintaining that prices in the country were adjusting themselves to such a ratio. But our industrial magnates, Sir Purshotamdas Thakurdas, Sir Victor Sasson and Mr. Ghanshyam Das Birla strongly opposed the Bill and pleaded for 1s. 4d. ratio. They were emphatically supported by several non-officials including Mr. Jinnah and Mr. Srinivasa Aiyangar but the non-official amendment was lost by 68 votes to 65, one of the largest divisions recorded in the Assembly, clearly indicating that a number of Independents and landholders also voted with the Government. An economic

measure of importance, in regard to which there existed acute differences between the Government and some of the opposition but regarding which the Government and the right wing of the opposition, that is, the Nationalist group managed to come to an agreement, was the Indian Tariff (Cotton Yarn) Amendment Bill, 1927. A section of opinion in the House, not confined to any particular party, wished to widen the scope of the Bill by including a protective duty on piece-goods and also a scheme for giving a bounty to the cotton industry, but another section of opinion was opposed to imposing any further duties in the interests of millowners themselves and the necessities of life.

An example of the reversal of its own decision by the Assembly when a measure had been returned to it after its passage in the Council of State occurred in 1927. The Finance Bill for 1927-28 fixed the salt duty at Rs. 1-4 as. per maund. The amendment moved by a Swarajist member reducing the duty to half the rate proposed in the Bill was adopted in the Assembly by 50 votes to 48. But when the Council of State disagreed with the Lower House over the respective values of the partial remission of provincial revenue, which was proposed in the Finance Bill owing to an expected surplus, and the relief which would be afforded by reducing the salt tax and restored the latter to its original figure the Bill returned to the Assembly, which passed it by 52 votes to 41. The Government evidently succeeded, in the meantime, to win over a few Independents to its side.

Providence too has not hesitated to favour the Government. Indeed, quite an unexpected victory was in store for the Government on Mr. Amarnath Dutt's Bill of 1926, to repeal the Bengal Regulation of 1818. The Home Member and the official member from Bengal, Mr. Donovan opposed it vehemently, but it was strongly supported from among non-official ranks. The trend of debate was rather indecisive though it was hardly expected that the Government would carry the division.

The division was taken in an atmosphere of excitement and the unexpected did happen, Government winning by 3 votes. It was found afterwards that some members of the Swarajist party were not attending the Assembly when the vote was taken.

At the winter session, in 1928, resolutions were moved in both the Houses with regard to the Statutory Commission. The one moved by Lala Lajpat Rai in the Assembly declared that the constitution and the scheme of the Statutory Commission were wholly unacceptable to the House and that the Legislative Assembly would have nothing to do with the Commission at any stage or in any form. A counter proposition was put forward by Sir Zulfiqar Ali Khan, leader of the Central Moslem Party in the Assembly, which declared that the procedure laid down by the Statutory Commission merited favourable consideration by the House. Members of the minority communities especially the Mohemadan and Europeans and Rai Bahadur M. C. Raja, the nominated representative of the Depressed Classes, welcomed cooperation and voted on the side of the Government against Lala Lajpat Rai resolution, while the Swarajists and Nationalists ranks did not favour cooperation and supported the resolution. Though, no doubt, Lala Lajpat Rai's resolution was carried by 68 votes to 62, it has been mentioned here to indicate how certain sections of the House opposed the popular view and cast their weight on the official side. The Council of State, as could well be expected, voted in favour of cooperation with the Statutory Commission by 34 votes to 13.

We shall now examine a few cases which occurred during the term 1931-34, when as we have noted before, the Swarajist party, the strongest mainstay of Opposition, was no more in the House. And we shall not fail to see how the Government claimed a majority on questions which could hardly have been applauded had the Swarajists been present in the House in sufficient numbers. The opposition, indeed, was not as strong as

it had been during the two preceding terms for the Nationalists and Independents who went to the Assembly in considerable numbers, were often inclined to take a 'liberal' view of things and could occasionally be induced to cooperate with the Administration even in some matters on which public opinion seemed to be definitely against the line of action contemplated by the Government.

The discussion on the Press Bill, designed to suppress the publication of matter inciting to or encouraging murder or violence, came up at Simla in 1931. The Bill evoked some opposition, the main criticisms being that it would muzzle the press and confer too great a power on the Executive without achieving the object with which it was framed. But, after slight modification in the Select Committee, it was passed in the the Assembly by 55 votes to 24 and, of course, unanimously by the Upper House. Another Bill which was taken up in the same session and which caused considerable excitement among the Mahomedan members was the Foreign Relations Bill, replacing an ordinance promulgated in 1931 and penalising publications calculated to interfere with the maintenance of good relations between His Majesty's Government and friendly foreign States. In effect it was said to be directed against articles defamatory of the rulers of certain States adjoining the frontiers of the country, though a section of the opposition contended that it was also applicable to Indian States. The Muslim members condemned it on the ground that it would affect their right to sympathise with their co-religionists in foreign countries. The Foreign Secretary explained that the danger was real and that it was better to muzzle a few irresponsible journalists, on whom the Ordinance had had a salutary effect, than to take the risk of impairing friendly relations with foreign rulers. The Bill was consequently passed on the 2nd of April, 1932.

Political criticism of the Government's policy against civil disobedience, described as "rule by ordinance", was voiced in

the Assembly during the debate on a resolution moved by Sir Hari Singh Gour, the leader of the Nationalist party on 1st February, 1932. Described by Sir James Crerar as a "curiously dovetailed piece of mosaic," Dr. Gour's resolution deplored the arrests of Mr. Gandhi, Mr. Sen Gupta and Khan Abdul Ghaffar Khan, disapproved of the fact that the various ordinances had been promulgated immediately after the conclusion of the sittings of the Assembly and of the manner in which they were being worked, condemned acts of terrorism and violence, no-rent campaigns etc., recommended that emergency bills in substitution of the ordinances be laid before the Assembly and urged that a committee elected by non-official members of the House be appointed to enquire into the atrocities reported to have been committed in the N. W. F. Province. The Government explained through Sir George Rainy and Sir James Crerar that they could not have asked the Assembly for powers in the previous session in anticipation of the emergency arising late in December. The resolution was opposed by the Government, but it is a pity that a number of our members joined it in voting down such a moderate and reasonable measure, by 62 votes to 44. Having taken a hint from Dr. Gour's resolution that emergency Bills might be brought forward in place of the ordinances the Executive introduced the Ordinance Bill at Simla in 1932. It embodied the main provisions of the Special Powers Ordinance and was based on the realisation of the Government that, while civil disobedience remained the accepted policy of a political organisation, the measures devised to combat it must be given a more permanent form than could be secured by Ordinances. But I wonder if Dr. Gour made his proposal for emergency bills in this light, for his idea was that thereby the Legislature would be able to discuss the merits and the need for passing emergency measures introduced by the Government and would be able to prune off its undesirably harsh provisions which it could not do in regard to Ordinances.

The Bill was however, debated at the Special Session which sat in November and December, 1932 and while it gave rise to much clamour in the nationalist press it aroused sober opposition in the Assembly, the general view being that not "repression" but speedy transfer of political power to Indian hands was the true remedy for the country's political ills. It was passed by a satisfactory majority of 57 votes against 31, indicating thereby the modification which the complexion of the House had undergone. The special November Session also saw the passing by 77 votes to 25 of a resolution moved by Sir Joseph Bhore, the Member in Charge of Commerce and Industries, recommending in general terms the acceptance of the Ottawa Agreement despite bitter criticism in nationalist circles. A few weeks later the bill itself namely, the Ottawa Tariff Bill was passed without a division in the Assembly.

The All-India Liberal Federation had passed in April 1932 a resolution demanding the release of political prisoners and the agitation that was going on in this connection came to a head on the motion of Mr. Maswud Ahmad in the Legislative Assembly, in 1933, recommending the release of Mr. Gandhi and other Congressmen. It was contended in support of the resolution that civil disobedience was in fact dead and no risk would therefore be involved in releasing the leaders of the movement. But, the Home Member, Sir Harry Haig, opposing the resolution, declared that there could be no talk of "peace" in such conditions as he suspected that the Congress wanted to secure a breathing space in which to gain strength for renewing the struggle in more favourable circumstances. On being put to vote, the resolution was defeated by a majority of 19 votes.

In 1934 the Assembly quietly passed a measure, although it had voted down much earlier in 1922 a similar one, which ultimately to be certified by the Viceroy. The new Bill was the Indian States Protection Bill designed to prevent unreasonable attacks on the administration of Indian States in the news-

papers of British India, and to provide the authorities in British India with adequate powers in dealing with bands of demonstrators organised on semi-military lines, for the purpose of entering and spreading disaffection in Indian States' territory. The passing of this Bill fully confirms the view that in the absence of the Swarajist group even the Lower House found it a very difficult task to register divisions against the Government in vindication of public opinion in the country.

These illustrations conclusively show that the decision taken by the Government of India in retaining its rigid control over the official members, in defiance of popular expectations and contrary to the policy outlined in the Montague-Chelmsford Report, was remarkably successful in bringing together to its side certain elements in the Legislature, more or less permanently, which would scarcely have cast their lot with it, with the steadiness and consistency with which they did, had the Treasury Benches and their official colleagues been found to be divided among themselves. Thus, with the steady cooperation and help offered to it, by some of the representatives of the minority communities, and the conservative loyalist sections and the occasional support of some of the Nationalists and Independents, the seemingly unimportant 'official bloc' could wield considerable influence over the proceedings in the House and succeeded in carrying numerous divisions against the popular and nationalist forces of the land represented in the Assembly. In the Council of State, the 'official bloc' exercised practically dictatorial influence and no decisions could be recorded against the views of the Administration.

But while the 'official bloc' exercised considerable influence in the Assembly during the post-reform period, it could no longer command the unhindered supremacy in sweeping the decisions of the House in defiance of non-official views as it had been privileged to do during the years preceding the inauguration of the Montague Chelmsford Reforms. It became

impossible for it to continuously dictate the proceedings of the Assembly and to flout opposition at will in view of the larger elected elements associated with the popular Chamber. The Government suffered a number of defeats. Up to the year 1930, the Legislative Assembly divided upon 431 occasions, with results favourable to it on 192. In 104 divisions on demand for grants Government was defeated in 56 and won 48. On Bills 139 divisions went in favour of Government and 91 against it. On resolutions and adjournment motions the majority was with the Government on 52 and against it on 45 occasions.

The actual modification which the position of the 'official bloc' underwent can be appreciated by considering a few typical cases in which the verdict of the Assembly was recorded against the Government. First, let us take up official measures which, on being thrown out in the Assembly, had to be ultimately certified by the Viceroy in the discharge of his responsibility. In 1922, the Assembly refused the introduction of the Indian States Protection Against Disaffection Bill, but since the Government attached great importance to the measure, the Viceroy was forced to exercise his special powers in order to enact it into law. Next year, the Assembly vehemently opposed the doubling of the salt-tax proposed in the Budget to bridge the gap between receipts and disbursements and subsequently rejected the Finance Bill by 59 votes to 44. The Bill had an easy passage in the Upper Chamber, and since the Government was determined to double the salt-tax, the special powers of the Viceroy were again called into play. The certification of those two Bills against clear verdict of the Assembly was a great disappointment to the Liberals who had gone to the Legislature in large numbers. A year later, when the Budget proposals came up for discussion, Pt. Moti Lal Nehru, the Leader of the Swaraj Party, moved for voting down the first four heads under the demand for grant including Customs and Income tax, because of the standing grievances of the people against the Government. The first

grant was rejected in the Assembly by 63 votes to 56. The Government, shortly afterwards, sustained another crucial defeat when on the opposition of Pt. M. M. Malaviya, for political reason, the motion for the introduction of the Finance Bill for 1924—25 was rejected by 60 votes to 57, the Independents combining with the Swarajists. The chief support of the Government came from among the European members, the members of the Central Muslim group, and a nominated non-officials. The Council of States, however, passed the Bill without a division and Lord Reading certified it, though the Salt-tax was reduced to Rs. 1. 4as. a maund.

Another measure for whose enactment the Assembly took no responsibility was the Bengal Criminal Law Amendment Act. On March 19, 1925, the Home Member, Sir Alexander Muddiman, announced in the House that the Government proposed to introduce a Bill supplementing the Provincial Act which had already received the assent of His Majesty in Council, by granting a right of appeal to the High Court to persons condemned to death, empowering the detention of certain persons in custody outside Bengal if such a step should be considered desirable and setting aside in cases covered by the Act of the High Court powers of issuing a writ of Habeas Corpus. The Swarajists and Independents did not oppose the introduction of the Bill because the first clause would be to the advantage of the accused persons. All the same, they made up their mind to reject the other clauses of the Bill, and when the matter came up for discussion they effectively carried out the course of action they had proposed. Lord Reading, thereupon, recommended to the House that the Bill be passed as originally moved but the Swarajists and Independents united in rejecting it by 72 votes to 41. It was, however, passed by our 'House of Peers' and the Viceroy soon directed under Section 67 B of the Government of India Act that it should come into operation forthwith. The cleavage between the Government and the progressive politi-

cians of our country was becoming more and more pronounced in regard to constitutional questions and matters of finance. The Cawnpore Congress had resolved that Swarajists should vacate their seats in the Legislature failing compliance with the terms of a resolution passed in the Assembly in February, 1924, which demanded the immediate holding of a Round Table Conference to recommend a scheme for the establishment of a full responsible Government of India. The Cawnpore Resolution was confirmed by the All India Congress Committee which met at Raisina on March 6 and 7. Accordingly, when the Budget for 1926-27 was presented by Sir Basil Blacket, neither the Swarajists nor the Independents took any part in the general discussion that followed, and eventually the Swarajists staged a walk-out. The President was forced to adjourn the house *sine die*.

An important matter in which the Assembly opposed the Executive and forced its Head to exercise his special powers came up in 1928. On September 4, 1928, the Government introduced the Public Safety Bill in order to combat the dangers arising from communist activities. It was directed against persons not being Indian British subjects or subjects of Indian States, who might seek to overthrow the system of Government established in India, by certain destructive methods. The remedy proposed was deportation by order of the Governor-General who would be empowered to remove from India British and foreign communist agents. The Bill aroused keen opposition among Swarajist and Nationalist ranks. Some modifications were introduced in the Select Committee such as those which limited its duration, in the first instance to five years; curtailed its scope by excepting from its provisions British subjects already resident in British India and provided for two classes of appeals. But on the motion for its consideration the voting was equal—61 against 61—and the President gave his casting vote against the motion, which was accordingly rejected. There-

fore, as the Bill could not be proceeded with, effect was given to principles contained in it by an Ordinance in April 1929.

The last two occasions on which the Legislature forced the Executive to act on its own responsibility again related to finance and came up in 1931. The main line of criticism that emerged from the general discussion on the Budget proposals for 1931-32 were: first, that the country was unable to bear the imposition of additional taxation as proposed by the Finance Member, and second, that retrenchments affected in civil and military expenditure were very inadequate, particularly in the latter. An Amendment was moved and carried, in the discussion on the Finance Bill, in regard to the increases in income-tax which, if given effect to, would have deprived the Government of about Rs. 240 lakhs of revenue. On the following day, the Viceroy recommended to the Assembly an alternative amendment to the Bill, which was designed to reduce the estimated revenue by Rs. 1,00 lakhs only; but the motion with regard to this was negatived in the Assembly. The Bill in a modified form, eventually had to be certified. The other necessity for certification arose just a few months later. During the first five months of the year, 1931-32, revenue receipts had fallen below Budget estimates to an extent which threatened a deficit of over 19 crores at the end of the year. To meet this situation adequately the Finance Member, Sir George Schuster, explained to the Assembly at the Simla Session that it was essential not only to take immediate steps, but also to provide for the continuance of those measures for 18 months, since the full effects of retrenchment would not be secured or financial equilibrium properly assured within 6 months. On this basis, estimating deficits of Rs. 19 crores in each of the years 1931-32 and 1932-33, the eighteen months' programme of taxation and retrenchments including cut in salary, announced by the Finance Member, budgeted for a deficit of Rs. 10.17 crores at the end of 1931-32 and for a surplus of 5.23 crores at the end of

1932-33. This eighteen months' programme was considered, by a majority in the House, as constitutionally improper and was strongly opposed as being inadvisable in the uncertain conditions prevailing at the time. The other main lines of attack were the inadequacy of retrenchment and the inexpediency and severity of the new proposals of taxation, which, it was urged, would on the one hand "tax the country out of existence", and on the other hand, suffer from the law of diminishing returns. Sir George Rainy tried to dispose of the objection to constitutional propriety of the procedure and Sir George Schuster attempted to show that substantial retrenchment had already been effected and that further economies were under consideration. But the Assembly refused to be convinced by such seemingly sympathetic tone of the Finance Minister and rejected the four proposals of taxation namely, the proposed tax on machinery, the increase in certain inland postal rates, the lowering of the limit of income liable to income tax and the imposition of surcharges on the income tax as increased by the Budget. Pointing out the gravity and exceptional nature of the circumstances, the Viceroy, recommended to the Assembly, in his message, the acceptance of the amendments which would restore the position originally contemplated in the Bill. But Sir Hari Singh Gour on behalf of the Nationalists, and Sir Abdur Rahim, on behalf of the Independents, dissociated themselves from further progress of the Bill and the amendments restoring the rejected clauses were passed. They, however, returned to the Chamber and joined in voting down the amended Bill by 68 votes to 48. Subsequently the Viceroy certified it after its passage in the Upper House.

Doubtless, in all these cases the opposition offered by a non-official majority of the House in rejecting official measures was set at nought by the Executive Head; but he did it all on his own responsibility. No more could the Executive, irresponsible as it has been, defend its policy in regard to these matters

on the plea of having behind it the support of the Assembly. The mere fact that recourse had to be taken to the special powers of the Viceroy on no less than eight occasions during the brief span of 14 years for implementing Government measures voted down in the Assembly, tends to show that the influence of the 'official bloc' in the House had begun to wane during these years and was not as effective as it had been for a long time prior to the year 1921.

Mention may now also be made of some of the other measures which the Assembly adopted against the opposition of the Treasury Benches. The firm stand taken by the Assembly in 1922 against the Budget proposals in cutting down Rs. 95 lakhs from various Departments and in refusing to raise the Salt-duty, the Cotton excise duty etc., was instrumental in determining the Government to embark upon a course of retrenchment in order to meet the resulting uncovered deficit of Rs. 9 crores, and subsequently led to the appointment of the Inchcape Retrenchment Committee. By passing the Racial Distinctions Bill in 1923, amending the Criminal Procedure Code in such a way as to obliterate the important distinctions between the trials of Indian and European subjects, it secured the removal of a very old grievance. During the Delhi Session of 1924, a prolonged and momentous debate was held on Mr. Rangachariar's resolution recommending to the Viceroy to take steps to revise the Government of India Act in such a manner as to secure for India provincial autonomy in the provinces and full self-governing Dominion Status within the Empire. Pt. Moti Lal Nehru moved an amendment recommending that a Round Table Conference should be convened to recommend a scheme of full responsible government in the country; this scheme after being placed before a newly elected legislature was to be submitted to the British Parliament for embodiment in a Statute. While a number of our members strongly urged the necessity of taking early steps towards constitutional progress, the Home Member, Sir

Malcom Hailey, emphatically indicated that the Governments' answer was in the negative and raised time-old pleas of defence and minority problems. Pt. Nehru's amendment was carried by 68 votes to 48, most of the elected members entering the lobby in its support. The only dissentient voices on the non-official side were those of certain representatives of minority communities, for the most part either Europeans or Mahomedans, who urged that the settlement of communal problems must precede further constitutional advance. During the same session other notable defeats inflicted upon the Government related to the passing of resolutions calling for the release of political prisoners, the repeal of Regulation III of 1818 and the imposition of countervailing duty on South African Coal imported into India. In 1924, the Assembly rejected the resolution moved by Sir Alexander Muddiman inviting the House to endorse in principle the main recommendations of the Lee Commission on the Public Services and accepted Pt. Moti Lal's amendment on it, to the effect that the House was unable on the material before it to satisfy itself of the propriety and reasonableness of the recommendations, by 68 votes to 46. The debate indicated that while the majority of the House was hostile to the recommendations of the Lee Commission practically all the elected European members and a few of the Independents favoured them. Sir Muddiman's resolution had, however, a clean passage in the Council of State.

At the Delhi Session, in 1925, Mr. Patel's Bill to repeal the Bengal, Madras, and Bombay State Prisoners Act of 1850, the Punjab Frontier Outrages Act of 1867 and the Prevention of the Seditious Meetings Act of 1921 was strongly opposed by the Treasury Benches and their faithful allies, the elected Europeans. But since it aroused favourable response not only from the Swarajistis but also from the most prominent members of the Independent group, the Bill was adopted, save the clause repealing the Punjab Frontier Outrages Act. During the same ses-

sion, the Assembly passed another private Bill introduced by Mr. K. C. Neogi, without a division, in spite of numerous protests made by the Europeans and the Government. The Bill proposed to amend the Railway Act in such a way as to provide against the reservation of railway compartments for any particular community. But the Council of State was quick to reject it. The non-official members had long been advocating a policy of prohibition as a means of checking the growth of intemperance. But the Government did not see eye to eye with them in the matter and a resolution which was tabled in 1918 demanding the acceptance of the policy of total prohibition was voted down. At the Simla Session in 1925 a resolution was again brought forward recommending the prohibition of import, manufacture, sale and use of liquor in India. But despite the opposition of the Government, an amendment was carried in the Assembly, by a majority of 30 votes, recommending the adoption of the policy of total prohibition as a first step to the inauguration of a system of local auction.

A year later, in 1926, the Assembly passed in an amended form a resolution moved by a non-official member demanding the release of political prisoners, though the Treasury Benches were opposed to it. On February 3, a member of the Swaraj party moved a resolution demanding, (a) the Repeal of Regulation III of 1818 and similar regulations in force in other provinces of India and urging the justice of releasing all political detenus or of bringing them to trial and (b) the grant of an amnesty to all political prisoners undergoing imprisonment. Thereupon, Pt. Moti Lal Nehru put forward an amendment that all detenus under old regulations and under the Bengal Criminal Law Amendment Act of 1925, be either immediately released or else brought to trial. Both the original resolution and the amendment moved on it were opposed by the Home Member, but Pt. Nehru's amendment was carried by a majority of 13. Besides the official members, the elected Europeans, the nomi-

nated non-officials, the members of the Central Moslem Group and a few conservatives entered the lobby with the Government. The year 1928 saw the adoption of the Reservation of the Coastal Traffic of India Bill by 71 votes to 46 in the face of solid opposition offered by the Treasury Benches.

Having considered the cases cited above, we are led to conclude that while its influence was considerably affected under the Montague Chelmsford Reforms, the Compact 'official bloc' has all along been a force to be reckoned within the Legislative Assembly, not so much because of its knowledge and experience of administration, but mainly because it succeeded in forming combinations and alliances with certain sections in the House owing to the peculiar heterogeneous constitution of the Assembly and to their own rigid solidarity. It also drew some strength as a result of some members taking a communal and sectional view of things at times. It took advantage of the numerous conservative, and separatist forces represented in the House and fully enjoyed the absence of the Swarajist group during the two terms in winning its most flashing triumphs on the floor of the Assembly. All the same the Government could not carry everything in its own way. A majority in the House, as we have already observed, took a strong stand on questions regarding constitutional advance, Indianisation in the Services, retrenchment, repressive legislation and taxation and successfully recorded its verdict by staging a number of victories against the Executive

Effect of the decline in the influence of the 'official bloc':

This decline in the control of the 'official bloc' was reflected on the proceedings of the Assembly in other ways too. The standard of debates rose considerably and occasionally reached a very high standard because the proceedings were no more as unreal as they had been before. Though the Executive remained the supreme master of policy the feeling that definite decisions could

at least, be recorded in response to public opinion in the country against the wishes of an irresponsible Government, encouraged many a non-official members to take greater and increasing interest not only in debates on resolutions but also in the constructive work of legislation. Consequently the bulk of private legislation, which was deplorably poor during the preceding period, now showed a tendency to increase. During the first eight years, 1921-28, 95 Bills were introduced by private members. Of these, 49 related to Civil Law, 19 to matters connected with Law and Order and only 7 dealt with social matters. The inevitably restricted facilities for non-official business, however, resulted in a large number of these bills lapsing. Fifteen bills were passed and 5 Bills which were passed by the Assembly despite Government's opposition were rejected by the Council of State.

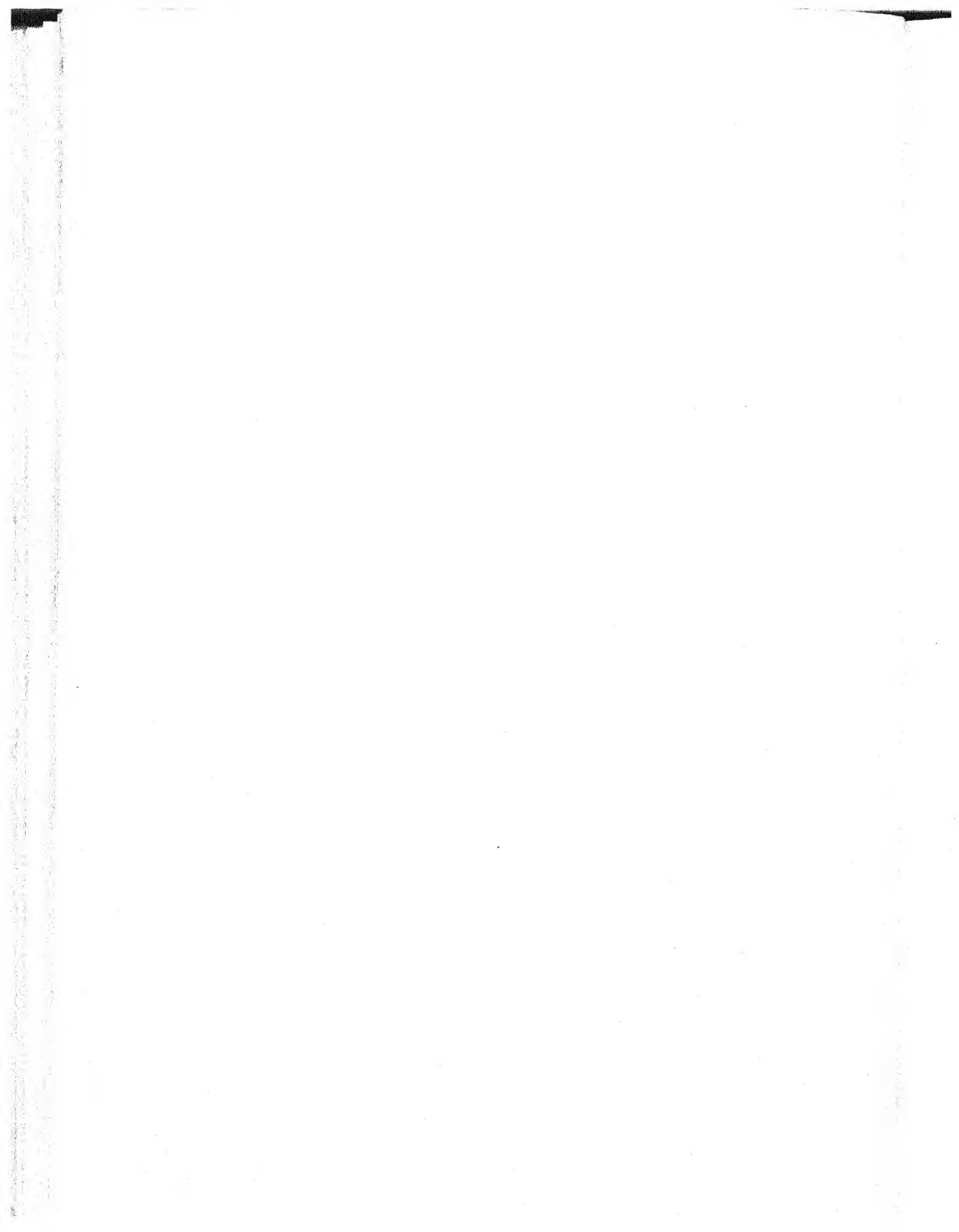
Conclusions: relations between official and non-official members still far from being cordial:

The relations between the progressive elements in the Legislature and the official members continued to be strained. Though most of them occasionally showed a conciliatory spirit and offered to cooperate with the Executive in a good many matters, they keenly felt the weightage which the solid phalanx of officials still exercised by inducing certain minority interests to cling fast to their policy. Particularly annoying to them was the situation in which they often found themselves of the Executive quietly enacting measures which the Assembly had definitely rejected. Another factor which contributed to the bitterness existing between the elected members of the House and the Government benches arose out of the fact that the Executive repeatedly failed to give effect to the commendable policies contained in several resolutions passed by the Assembly. The last, but not the least important, cause of this friction was the position of constitutional helplessness in which our members were

placed by setting up an Upper Chamber with practically coordinate and equal powers to those of the lower and the retention of a powerful Executive irresponsible to the Legislature. Let us hope that the relations among the members of the Federal Legislature, which is likely to be inaugurated soon, will be more cordial and fruitful in the absence of an 'official bloc' in it.

I am very grateful to Dr. Beni Prasad, whose valuable guidance and suggestions were of immense help to me in completing this paper.

SECTION III
PHILOSOPHY



THE PHILOSOPHY OF THE SĀRIRAKA BHĀSYA

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INTRODUCTION

The earliest period of Hindu Philosophy, namely the Vedic period is neither critical nor truly metaphysical. Being the first philosophy of a people, it is religious in character, and consists chiefly of cosmological discussions. But in these many and varied discussions, abstract and philosophical ideas are not rare. These form the germs of the later Upaniṣadic thoughts.

Religious observances alone cannot satisfy human mind. The elaborate and also mechanical system of worship which grew up round the Vedic gods, and the belief in the efficiency of rituals for man's happiness and peace in this world and the next, failed to quench the scientific attitude of human nature. The exaggeration and extravagance of the sacrificial cult brought a reaction against itself, and ultimately cosmology had to make way for metaphysics. In the Upaniṣads, which form the main-spring of Hindu philosophy, for the first time, are seriously discussed the fundamental problems of philosophy—that of the world, the self and God. But there is a want of a systematic study, or an order in the evolution of thought. The Upaniṣads are the illustrations of free and bold attempts to find out truth. It is difficult to demonstrate that any particular doctrine is the object which is taught in the Upaniṣads. Theism, Pantheism, Idealism, Realism, Materialism—all are scattered about here and there. Fanciful word-plays, redundant repetitions, far-fetched symbolisings are frequently found in the Upaniṣadic texts. The progress of the argument is greatly dis-

turbed by digressions and vague analogies.

To make a system out of these scattered gems of philosophical truths of the Upaniṣads is an attempt in the Brahma-Sutras of Bādarāyana. The Brahma-Sutras also try to explain and establish its own monistic philosophy, against the doctrines of the Samkhya, the Yoga, the Vaisesika, the Nyaya, the Mimamsa; and even the Bhāgavadgita, Manu Samhita and Panch-ratra are not excluded for references. The Brahma-Sutras are divided into four Adhyayas, each Adhyaya is again divided into four Pādas, and in all it contains 555 Sutras.

The Brahma Sutras are differently interpreted by different thinkers; every one of them trying to prove and establish that his own views express the true import of the Sutras. Of these expositions and interpretations the commentary of Saṃkara seems to be the best. Saṃkara's success is due to his definite distinction of esoteric and exoteric doctrines, which boldly tries to solve and reconcile the contradictions and antithesis underlying monism and pluralism, theism and atheism, Being with attribute and Being without it. Saṃkara does not claim to make an original system of philosophical thought, but in the Sāriraka Bhāṣya what he tries to prove is that the Upaniṣads clearly point to an Absolute Monism, and that the Brahma-Sutras try to establish it.

Throughout his commentary it is found that Saṃkara criticises other rival interpretations which try to show that the Upaniṣads favour the dualistic Sāmkhya Cosmology. Because the Brahma-Sutras are regarded by all the commentators including Saṃkara, as the condensed form of the Upaniṣadic philosophy, hence for Saṃkara the ultimate validity belongs to the Śruti. In order to prove that other interpretations are not correct, he gives plenty of references from the scriptures. Like other commentators he also freely quotes from the Upaniṣads to show that his own interpretations bear the true import of any Sutra.

It is also found that Śaṅkara frequently tries to establish his own viewpoint by referring to commonsense. He also takes advantage of the conventional and traditional use of certain terms and phrases.

But in spite of his strict adherence to logical procedure of argumentation, he commits himself to many a digression, and cannot always remain critical. The Absolute Monism which he preaches in his Sāriraka Bhāṣya is not an outcome of his own personal intuitive experience. What the Upaniṣads proclaim and the Brahma-Sūtras systematise, that Śaṅkara more elaborately explains by pointing out the contradictions, inconsistencies, and weak logic of the opponent philosophers. The most formidable opponents are the Mīmāṃsā and the Sāṃkhya. Śaṅkara also explains and interprets many scattered ideas about cosmology, eschatology, physics etc. For him logic does not occupy the pre-eminent position, it is only a means to a rational grouping and consistent interpretation, of the purport of the Upaniṣads, which are the unconditional and uncontradicted testimony of the absolute truth.

THE ONLY ETERNAL (*Brahman*)

According to Śaṅkara the only object of the Upaniṣads is to declare that Brahman is the only eternal substance. In the second Adhikarāṇa of the first Adhyāya an attempt has been made to define this ultimate reality. This variegated world which is expressed in different names and forms, which contains numberless agents and enjoyers, and which is the locus of space, time and causality, action and reaction, this world of manifold, which is so complex in its constitution and so inexplicable in regard to its nature, that thought cannot grasp it. The origin, subsistence, and dissolution of such a world must depend on some cause which is omniscient and omnipotent. Such an ultimate cause is Brahman, which is the only eternal entity.

In the third Adhikarana it has been pointed out that if the scriptures like the Rigveda etc. are the sources of eternal knowledge, and if these are born of Brahman, then the cause of eternal knowledge must be the Being which is omniscient. The Sruti also declares that such scriptures are the effortless outcome of Brahman.

But Jaimini has shown with reasonings, that any *promāna* is established by the fact that it suggests an action; and that the Vedas are always suggestive of actions; hence the Vedānta which suggests only the "Jnanamārga" is not a *promāna*, and thus useless. The Vedānta cannot give us knowledge of the eternal self-proved Being; for such a Being must be an object of *promāna*. What eternally is, that cannot be the object of any "bidhi". For "bidhi" suggests work and not knowledge. So, if the Vedānta considers itself to be a *promāna*, it must be included in the "bidhi"; and hence what it teaches is not anything about the eternal Brahman, but only "Upāsana", which is a particular type of religious act.

In the fourth Adhikarana Śaṅkara meets the above argument of the Purvapaksin. He points out that all the sentences in the Sruti declare something about Brahman, which is the only object of the Vedantic thought: and not, that it suggests any particular type of "Upasana" or "Upasaka". Brahman is not an object of "Promāna" or "Anuamna". Moreover, after the knowledge of Brahman there remains no distinction between "Upāsana" and "Upāsaka". The knowledge of Brahman does not leave any difference between the doer and the doings. Hence Brahman cannot be included in the 'bidhi'. The Mimāṃsakas raise the objection that even if Brahman be the object of the Sruti, it is not proved that the Vedānta expounds it as in a separate treatise. Brahman is rather taken as supplementary to the acts of religious duty. The declaration of the Sruti "meditate upon Brahman" is definitely an act of 'bidhi'. Again, as the 'Purva Mimamsa' and the 'Uttara Mimamsa' are

both scriptures, it is proper to interpret the latter in the light of the former. The sentences of the Sruti, like "the self is pure, it is to be searched out", "know him", "the knowing of Brahman is becoming it"—are suggestive of action. The acts of religious duty create a desire in man to know what Brahman is. And the attributes mentioned in regard to the nature of Brahman are to satisfy this desire. The mere enumeration of the attributes of Brahman, without performing religious observances, is useless. A thousand times hearing about the nature of Brahman cannot remove a man's ignorance. Knowledge alone is not sufficient for deliverance. Work is also necessary.

But Śaṅkara points out that deliverance is not the result of performing the acts of religious duty. Liberation is the very nature of the ultimate reality. It is not something which is to be achieved as a reward after great efforts. It is already with us. In the Sruti also we find that the performance of religious observances may bring heavenly joys, but cannot bring liberation. For liberation, knowledge and meditation are essential. The nature of the ultimate deliverance, on the other hand, is an experience which is free from both sorrow and happiness. When the individual self is beyond the influence of sorrow and happiness it then enjoys final liberation. Hence deliverance or Moksha cannot be the consequence of the acts of religious duty.

The Pradhāna of Sāṃkhya is also called eternal, but yet it is altogether different from the eternal Brahman. The Pradhāna is eternal in the sense, that its changes are changes in form only; materially it remains the same. The 'world' of Vaiśeṣika is also eternal in the same sense, but Brahman is not subject to formal or material change. It is all-pervading, self-luminous, and unchangeable pure being. For this reason the Sruti declares that the ultimate reality is beyond all kinds of activities. This shows that the subject of enquiry in the scriptures is Brahman. If the enquiry into Brahman be supple-

mentary to religious observances, deliverance would become transient. But the Sruti declares always, that deliverance is eternally existent, and never conditional

The knowledge that Brahman is the absolute reality is not the outcome of rational thinking. The empirical way of thinking, viz.,—"Because the mind has infinite aspects, and because God is infinite, therefore the mind is God"—is unable to make us know of the true nature of the highest reality. For the Advaita philosophy religious observances are also empirical. Hence the highest reality which the Vedanta speaks of, cannot be supplementary to the acts of religious duty. Deliverance is not that which is produced for the self; nor it is a modification of the self. It is neither an act, nor the fruit of an act. Deliverance is the very nature of the self. The only Eternal is always with us. That which is always with us cannot be achieved again.

It may be said, that as an unclean mirror regains its power of reflection by rubbing on it, so it is by some act, that the ignorance is removed and the self is revealed in its true nature. So, that ultimate deliverance must be the outcome of certain act. But this is impossible, because the self cannot become, it always is. Hence modification or transformation of the self is impossible.

Again, it may be argued that acts like bathing etc. purify the self and hence change it. That is not true. For it is the body, the senses, and the mind which are thus purified. The Self remains just as a witness: it is never an agent or an enjoyer. When the man says: "I am recovered", what this "I" suggests, is not the real self, but the empirical self. The real self has no desire. The self-luminous self is beyond nature and form and change. It is due to our ignorance that we clothe it with our anthropomorphic categories. Thus the Only Eternal is never subject to the influence of any act. Only knowledge has any claim for the approach to enquire into it.

This Self, or Brahman, or the Only Eternal is also the cause of this World. The Samkhya school thinks, that not Brahman, but the Pradhān is the cause of this world. The Scripture does not declare that the eternal Being is Brahman which is the cause of the world. For, which is eternal, that always is; and which is, that, can either be perceived or inferred. Hence needless it is for the Scripture to declare such eternal Being.

Both the Samkhya and the Vaisesika school think, that for the origination of the world there should be the material as well as the instrumental cause. The former has the Pradhana and the Purusa, the latter has atoms and Isvara, for this purpose. The Samkhya declares that the Pradhāna is the cause of the world, and this Pradhana is also omnipotent and omniscient. According to the Samkhya school an omniscient being is a being which possesses the quality of being omniscient. It is beyond our imagination that there may exist a conscious being which is knowledge-as-such but has neither body nor the senses. When the Vedantist says that Brahman is omniscient, what he really means is that Brahman is not knowledge-as-such, but that knowledge is an attribute to it. If this knowledge remains potential, the Vedantist does not believe in the existence of any cause which might bring this potential power into action. Hence he becomes illogical. Moreover the growing of the formless into any form, without a body and the senses, is simply impossible. The Samkhya on the other hand has no such absurd logic. For the Pradhāna has with it the qualities Sattva, Rajas and Tamas, and also the quality of change. Thus the Pradhana and not Brahman must be the cause of the world.

In the fifth Adhikarana of the first Pāda of the first Adhyaya Samkara meets the above objection of the Samkhya school. Samkara points out that the Pradhana cannot be the cause of the world, for the reason, that the Pradhana is inert. It is said in the Upanisads that whoever may be the cause of the world, he created it with deliberation. The Eternal Existent wished, and

the formless took a form, to be called the world. The one thus expressed itself into many. Moreover, the Pradhana cannot be omniscient. Because knowledge originates from the quality Sattva, which must predominate; but the Pradhana is conditioned by the baser qualities Rajas and Tamas. Such a kind of limited Pradhana cannot be omniscient. Again, the quality Sattva must be related to an intelligent principle, a Sāksin, to call it knowledge. But the Pradhana is non-intelligent. Hence the Pradhana is not omniscient.

The Sāṃkhya philosophy continues again, to raise the objection that Brahman has the eternal activity of cognition, but that, it is also conditioned by this eternal activity, hence not omniscient. But Sāṃkara replies, that the possessor of the eternal activity of cognition, one who throws light on all other objects, cannot be otherwise than omniscient. The sun which is the agent of heat and light is universally accepted as a free-agent, without reference to any external object which gets heat and light. So is Brahman which is knowledge-as-such, and not conditioned by the act of knowing.

The Sāṃkhya replies that there must be a relation between the knowing Brahman, and the known objects. But before creation there was no such object; then how such relation had been possible for Brahman which at that time was not devoid of cognition? Sāṃkara says that the relation was possible because even at the parental stage of the world there were name and form, yet unevolved, but about to be evolved, which are neither identical with nor different from Brahman. The objection that before creation, before the existence of the objects of thought, Brahman was devoid of cognition, does not hold, because Brahman is thought as such. The Upanisads declare that Brahman is the revealed one in which the many exist, so that the One, being the cause of the many, is also independent of the many. Another objection is, that if the Sruti declares that there is no difference between Brahman and the transmi-

grating soul, how the latter has its knowledge dependent on the body, whereas the former has not? In reply, Saṃkara says, that indeed there is no difference between Brahman and the transmigrating soul; but just as we give separate names like 'a jar,' 'a pot' to a limited ether, though there is no difference between the ether limited under the name of a jar, and that outside it; likewise the difference between the migrating soul and Brahman. The attribute is apparent, and is due to illusion. Thus the apparently migrating soul has apparent dependence of its knowledge on an apparent body.

The Samkhya then says that cognition might be used figuratively for a non-intelligent being. For we often use such sentence as "The river bank falls." In the Scripture also there are passages like "That fire thought," "That water thought." Hence, the figurative use is allowed even where the Being is the doer. But Saṃkara points out, that to attribute the non-intelligent Pradhana with intelligence even figuratively, is absurd. Those sentences of the Sruti are there it is true, but there are also words 'god,' 'ātman,' 'jiva' etc. which suggest that the agent here is some intelligent being. The Sruti also declares, a little further from where those sentences are quoted, that the Being is the Ātman. The real import of the Sruti is that the Being is intelligent; and that fire, water, etc. which are sometimes attributed with words suggestive of intelligence are mere indirect references. Another objection that words like 'bhutātman,' 'indriātman' etc. prove that 'ātman' might as well mean something non-intelligent. Hence 'ātman' may mean the Pradhana. Saṃkara meets this objection by saying, that the Sruti is of opinion, that with the help of a 'guru' a man can know Brahman, and after his death he becomes the Eternal Being. If the Pradhana is the Eternal Being, the man, after his death would become the Pradhana, that is, he would become non-intelligent. This is absurd. If we rely on the indirect and metaphorical meaning of any sentence, we should be led to the

region of absurdity. For instance the sentence like "I am the hymn" cannot be literally true. Moreover the word 'ātman' cannot mean anything non-intelligent, because it has been used in the Sruti in relation to *Sevtaketu*, an intelligent being. A man in deep sleep becomes unconscious of the external world, and then only the ātman merges into Brahman. But if the Pradhana is non-intelligent, the intelligent ātman cannot become the Pradhana, in deep sleep. In the Sruti there is mention only of one intelligent cause of the world. Hence the Pradhana cannot even be taken as a secondary cause of this world. In the declarations: "From the ātman came out the ether," "All things known and knowable are born out of the ātman," "This prāna takes its origin from the ātman" etc., the ultimate cause seems definitely to be some intelligent principle. Hence the Omniscient Brahman is the only one cause of the manifold existence.

In the seventh Adhikarana of the fourth Pāda of the first Adhyaya Samkara again discusses about the cause of the world. Here he shows that Brahman is both the efficient as well as the material cause of the world. Because, matter is not outside of Brahman, matter is something having name and form, hence it depends on Brahman. Moreover the world originates from, and perishes into, Brahman; and the Sruti declares that Brahman made Himself. Thus, the Eternal Being is the agent as well as the material of his work.

In the second Adhyaya, first Pāda, third and fourth Adhikaranas he discusses how intelligent Brahman can be the cause of the non-intelligent world. The Nyāya school objects that Brahman cannot be the material cause of the world; for the reason, that one is intelligent and the other is non-intelligent; and the causal relation between them is not possible. Samkara points out that the relation is possible. The non-intelligent is born out of the intelligent, and vice versa. From the intelligent man come the non-intelligent hair, nails etc. From

the non-intelligent cow-dung originates the intelligent worm. The Purvapaksin replies, that the above is possible because in man and the cow-dung there exists a common quality—that of being terrestrial. Saṃkara then points out, that if any such common quality is admitted, it gives a better argument to the Vedantist. For in Brahman there is the quality “being,” which is also in everything originated from Brahman. Some think that nothing is non-intelligent. What seem to be non-intelligent are really potentially intelligent. But this is not true. In the Sruti non-intelligent things like water, air, etc. are treated as intelligent, but there only the gods, residing in those non-intelligent objects, are suggested. Saṃkara now points out three difficulties which are in the mind of the Purvapaksin, if the pure Brahman is taken to be the cause of the world :

- A. At the time of the Final Dissolution or Pralaya, this imperfect world would unite with the perfect Brahman, and thus it would make Brahman impure.
- B. Creation begins with divisions ; but after Pralaya there would exist no divisions, and hence recreation would not be possible.
- C. At Pralaya the jivātman would merge in Brahman. Thus the liberated souls would be with Brahman ; and at the time of recreation, these liberated souls might be born again.

Saṃkara now shows, that these difficulties are not real. The ever-pure Brahman cannot become imperfect after Pralaya. For the pots of clay when again becomes clay, do not change the clay. The effect cannot remain in the cause as an effect. If the effect is in the cause as an effect there is no Pralaya. In spite of the fact that the cause and the effect are one, it is true that the effect comes out of the cause. Moreover this effect is altogether an illusion, hence does not really exist. What does not exist

cannot contaminate that which always exists. Again, it is not true, that what is once united to become the One, cannot be made divided again into the many. In deep sleep the jivatman becomes one with Brahman, but when awake there again comes the distinction. This union is transient because the avidya is still with the jivatman, as samskāra. But the liberated ones are not born again, because the avidya is destroyed for ever.

In the next Adhikarana Samkara discusses again about the non-difference between the cause and the effect. There is no real dualism between Brahman the cause, and the world the effect. In the Ch. Upanisad it is said that if one knows clay one knows the pots. All is Brahman. To know Brahman is to know everything. The many is altogether illusory. Duality exists only in the empirical world. The One is not the pre-developed state of the many; it is altogether a different category—the only real category; all else is mere phenomenal. One may object again, that from the analogy of the pot and clay, it might be, that the many is a transformation of the One. But that would be against the Sruti, where it is said that Brahman is attributeless and changeless. That the cause and the effect are identical, is proved by the fact, that without knowing the cause the effect cannot be thoroughly known. A man can know a pot by knowing what is clay. But by knowing a cow he cannot know what a horse is. The effect lies potentially in the cause. The pot was in the clay before it was made, and so was the curd in the milk. But the pot cannot be made out of milk, nor the curd out of clay. There may be another objection, that the whole effect cannot remain in the cause. One single thread cannot give an idea of a cloth. Moreover if it is admitted, that the creation is an act, it is also admitted, that it required an agent. With this admission it is proved, that before the agent was active the creation was not. The pot has the potter for its cause, and before the potter's making the pot, it did not exist.

But the above objection is not valid. The truth is, that

the effect existed before, not as an effect, but as a potential effect. To bring out this potential effect into a revealed or perceptive one, is the work of the agent. A young father becomes old, but he remains a father still. If we think that the old man is not the same man who was once young, we deprive him of his fatherhood. The fact is, that one single cause exists in different effects, like an actor who acts several parts. The thread and the cloth are different only in form; but they are same in matter. Threads arranged in a particular way is cloth, another way, a rope. The cause revealed is the effect.

Samkara now interprets certain terms which occur in the Upanisads. In the sixth Adhikarana of the first Pada of the first Adhayaya he begins with the word "ānandamaya" which occurs in the Tait. Upanisad.

In the Tait. Upanisad it is said that, the self consists of Annamaya, Prānamaya, Monomaya and Vijnānamaya Kosas, one inside the previous one. But apart from these, there is the Ānandamaya Kosa which is the innermost of all. Now the problem is, that because this Ānandamaya Kosa belongs to the series, and because the other kosas are different from Brahman, and also, because the conception of the same kosa is not without bodies and attributes,—whether this kosa is different from Brahman. From the above considerations it seems that the Ānandamaya Kosa must be the jivatman and not Paramatman.

Samkara points out that the word "anandamaya" refers to Brahman, and in the Sruti the word has repeatedly been used to denote Brahman. It is also said there that the jiva gets Bliss from the Blissful Brahman and none else, and that without this pure Bliss no being could have existed. Bhrigu knew that Bliss is Brahman. In Br. Upanisad it is declared that knowledge and bliss are Brahman. Hence the word 'ānandamaya' should denote Brahman. Samkara also points out that the Sruti declares Brahman as the distributor of bliss. One who gives bliss to others, must have abundance of it in himself. Moreover, one

who knows Brahman, he attains the highest truth. This Ānandamaya Kosa though is at the highest end of the series yet does not belong to the series, hence this highest end which a man attains, is Brahman. Other kosas have empirical qualities, but the last one, in spite of its being at the end of the other kosas, is free from such. It is to avoid an abrupt statement that is why the Sruti first speaks of other kosas and then speaks of the Ānandamaya, thus adopting this means of describing gradually crude stages of preliminary character before mentioning the real subtle absolute stage. That of the bodies mentioned in regard to the Ānandamaya Kosa is only metaphorical. Of the two derivative meanings of the word 'anandamaya', considering the meaning of the suffix 'mayat,' namely 'modification' and 'abundance,' Samkara thinks the latter to be more appropriate. For Brahman has no modification, but might have abundance. He then points out that in the Tait. Upanisad it is said that *He* is Bliss, and after getting bliss from Him that *it* becomes blissful. Thus the distinction between Brahman and the jiva is pointed out here. Jiva the receiver, Brahman the source. But this distinction again, is not real but an illusion due to avidya. In reality, the jivatman and Paramatman are the same—absolute entity. Samkara next proves that this Ānandamaya cannot be the Pradhana, for it is declared that the Ānandamaya wished to become many; and the Pradhana being non-intelligent has no wish and no bliss.

The Sruti also declares, says, Samkara, that the atman ultimately, when free from any trace of duality, becomes bliss, and then becomes free from any fear for being entangled in the worldly attachments. Hence if 'ānandamaya' means the jiva, such consequence for the atman is not possible. Moreover 'ananda' is a thing which is limitless, hence cannot point to anything else than Brahman; not even Saguna Brahman, but only Brahman attributeless. Thus, 'ānandamaya' denotes Brahman.

But we must notice here that Samkara's argument which

tries to meet the objection in regard to the series of kosas, is not satisfactorily conclusive. Being at the end of a series how the Ānandamaya Kosa is free from the attributes belonging to that series, is not clear. If this anandamaya be some strange entity of an absolute different category, why the word 'kosa' has been used with it? We become anxious to know what happens to the Vijñanamaya Kosa which is perhaps the last limit of the empirical reality. From the Vijñanamaya to the Ānandamaya there is a gap; the gap between the empirical and the real. And if there is no empirical, which according to Sāṃkhya, is a fact, then this gap itself is phenomenal. Is the Vijñanamaya the limit of the intellectual dialectic, and the Ānandamaya the zone of intuitive, experience?

In the Ch. Upanisad it is declared that there is a glorious being in the sun whose whole body is lustrous and whose eyes are like the petals of a scarlet lotus, and which is also free from all sin. The worshipper who knows this, becomes free from sin. This being in the sun is not some higher being, but it is Brahman. Only Brahman is free from all sin. It is also said that it is all-pervasive; and all-pervasiveness is not a quality of a limited being. Thus where it is spoken of absolute freedom, it is spoken of Brahman. The description of Brahman's form and attribute is not unjustifiable; because, for the worshipper, Brahman voluntarily takes illusory forms. He is perceived because of these attributes, otherwise He is beyond perception. The fact is that where Brahman is described as the attributeless and absolute, there is also said that He is infinite and beyond senses and forms. On the other hand when Brahman is spoken of as a worshipped being, there He is taken to be one possessing supernatural attributes. Here Brahman is an object of worship, hence the 'being in the sun' is described as possessing attributes and forms. Because He is infinite therefore He may be conceived as living in the finite as well. The

Sruti then mentions that one who is not the sun but yet is in it, and controls it, is the atman of man, and is Paramatman. Thus the being in the sun is Brahman.

In the same Upaniṣad it is declared that all beings originate from the ether, and all is dissolved in it. This 'ether' here stands for Brahman; because there are sentences like "If this ether be not the bliss...", "Ether is the cause of the subsistence of name and form, in whom name and form are conceived is Brahman." The Purvapakshin's acceptance of the general meaning of "ether" is because of its clear significance. It is really true that from the ether originates everything:—ether, air, fire, water, earth, vegetables, food, the jiva. But this way of thinking is not correct; because the origination of ether itself is from Brahman. Moreover 'ether' has been used here in the Sruti to stand for the eternal one, amidst the evanescent many. Hence ether is Brahman. In the twelfth Adhikarana of the third Pada, Saṃkara again quotes the Ch. Upaniṣad and proves, that the word 'ākāś' really denotes Brahman; because this 'ākāśa' is the cause for the revelation of name and form, itself remaining beyond those categories.

In the same Upaniṣad is also mention of prāṇa, which is a god to meditate upon, and from which everything originates and into which everything perishes. But this prāṇa is not the vital breath, but Brahman. In the Sruti it is also said that all the gross matter cease to function at the time of sleeping, and become one with the prāṇa. But while sleeping, all the gross matter do not cease to function, only the senses do. All the gross matter cease to function when they become one with Brahman. Hence prāṇa denotes Brahman.

In the ninth Adhikarana of the same Pada Saṃkara again discussed the above question. In the Kousitaki Upaniṣad it is told that Indra is the prāṇa, and one should worship him; this prāṇa is the Prajñātman, bliss and without disease or death.

The Sruti further declares, that by knowing him (Indra) all sin is destroyed. Moreover epithets like 'prajnatman,' 'blissful,' 'immortal' etc. are also used. Hence prāna must denote no other than Brahman. But the word 'speaker' used in this context might suggest that prana is the jiva. Saṃkara points out that by knowing the jiva sin cannot be destroyed. Prana is not even a god though Indra calls himself the prana. Indra advises the worshipper to know himself, because Indra himself knows Brahman, and by knowing Brahman he became Brahman. Thus by knowing himself means by knowing Brahman. What is said in the Prasna Upanisad is also suggestive of either jiva or the vital breath. But the whole context is centred round some ultimate being, who is immortal and blissful. The word 'speaker' also means the atman. "Know the ātman and not the Speech" means know the ātman and not the body. Saṃkara again points out that here is not discussed the different objects of worship, but rather the different modes of worship. Brahman may be worshipped in three modes of feeling—jīva-bhāva, prāna-bhāva, and Brahma-bhāva.

In the third Pada of the same Adhyaya Saṃkara, in the tenth Adhikarana, again raises the topic, and points out that in the Katha Upaniṣad it is declared that the prāna is the locus of the world. This 'prāna' also denotes Brahman, because none else can be the locus of the world.

In the fifth Adhikarana of the fourth Pada of the same Adhyaya Saṃkara again quotes the Kaisataki Brāhmana, where it is said, that the prana is the enjoyer. There are mentioned qualities also, which definitely point out that this prāna is not the jiva, but Brahman. Because it is said there, that this prana is "the maker of those persons of whom all this is work." Such a creator of minor creators can neither be the vital breath nor the jiva.

After proving that the prāna spoken of in the Sruti is Brahman, Saṃkara now proceeds in the tenth Adhikarana to prove

that "light" mentioned in the Ch. Upanisad is no other than Brahman. The light, declares the Sruti, which shines above the heaven and all other things and beings, and also reflects in every one, is the light, which is within the body of man. This light apparently signifies the sun, and is generally accepted as such. The argument in favour of this is, that Brahman being attributeless cannot have lustre and reflection, which are the characteristics of light. Hence 'light' does not mean Brahman, but rather a subtle and super-sensual lustre, if not bodily lustre. Śaṅkara then tries to establish that 'light' denotes nothing else than Brahman. Because in the same context it has been declared that the gross world is originated from the most perfect being Brahman. The sentence before and after the above doubtful term 'light' suggests and points to the fact that the discussion there, is on Brahman. Hence 'light' should also denote Brahman. Again, Brahman may be called light metaphorically. What reveals all other things, may be termed as light. Moreover, light is the visual symbol of Brahman for meditation.

In the second Pada of the first Adhyaya Śaṅkara interprets certain ambiguous terms and phrases, and proves that they denote Brahman. For instance, in the Ch. Upanisad it is said that the being with mind and breath, is to be meditated upon in the lotus of the heart. The Purvapaksin says that this being is the Jīva, for Brahman has neither mind nor breath; moreover Brahman is beyond space, and hence cannot be localised. Śaṅkara however points out that the context is a discussion on Brahman, and thus Jīva is not here suggested. The words "mano-maya", "Prāna-sarira" are justly used because Brahman being all-pervasive may be described thus. The jīva expresses itself only through the body, whereas Brahman expresses Himself through everything. Again, that the infinite Brahman cannot be localised is not true. Because Brahman exists everywhere, and which exists everywhere, may certainly exist in a particular place. This is how the infinite Brahman is meditated upon in

the finite heart. The not-yet perfect human mind being incapable of conceiving the Infinite as infinite, begins first with the finite and localised. One must pass the limit, to reach the limitless. But the Purvapakshin continues that if Brahman lives in the jiva, He must be subject to pleasure and pain, But Saṃkara here reminds that the question of pleasure and pain arises only in the dualistic plane. In reality there is no difference between the jiva and Brahman. The jiva is Brahman. For except, Brahman nothing really exists.

The second Adhikarana begins with the declaration of the Kath. Upanisad "he brings the world into dissolution." This agent may be fire, the jiva, or Brahman. Saṃkara proves that this is Brahman, because even fire cannot destroy everything; neither the jiva can.

The fourth Adhikarana begins with the discussions on the sayings of the Ch. Up. that, the being seen in the eyeball is the atman. According to many, this being or as it is called the atman, is the sun; for others this being is the jiva, and for many others this is nothing but a shadow. Saṃkara there points out that the context speaks of Brahman, and by "atman" Paramesvara is meant, hence this being is no other than Brahman. The Sruti here speaks of immortality which cannot be attributed to the jiva or the sun or the shadow. To the objection that the infinite Brahman cannot remain in the finite eyeball, Saṃkara says that for the purpose of worship such metaphorical suggestion may be allowed. The Sruti also declares, that the result of meditation upon this being is the union with Brahman after death. This definitely points to Brahman. Neither this being is a shadow; for a shadow is evanescent and never eternal; moreover there is nothing material before the worshippers' eyes so as to form a shadow on the eye. Again, immortality cannot be attributed to a shadow. Thus the being in the eye is no other than Brahman.

In the Br. Up. it is declared that one who is in this earth

yet outside of it and controls it living in the heart of man, is the Antaryāmin. This Antaryāmin, the other schools think to be either a god or Pradhana. But Saṁkara shows that it is neither. This Antaryāmin is unknown to the earth, hence cannot be a god. Neither it can be the Pradhana; because the Pradhana is non-intelligent and thus incapable of being all-knowing. The Antaryāmin is not the jiva, for the reason, that the jiva cannot control the earth and is not outside of it. Hence this Antaryāmin is Brahman and none else.

In the Mm. Up. it is said, that by which the absolute Brahman is known, is called the Parā-Vidya. The Primal cause which is beyond the sense as well as intellect, which is eternal and all-pervasive is known to the meditating mind. But what is this Primal cause? In the sixth Adhikarana Saṁkara points out that this is not the Pradhana. The cobweb may be the outcome of the non-intelligent spider, but the cobweb is not a living world of intelligent beings; the non-intelligent spider might produce something non-intelligent. Thus the analogy of the cobweb for the Pradhana is false. Moreover the Sruti declares that of the two, Parā-Vidya and Aparā-Vidya, Rg. Veda belongs to the latter. As the fruits resulting from the Para-Vidya is Deliverance, so the object of the Para-Vidya is Brahman. The knowledge of the Pradhana cannot give Deliverance. This Parā-Vidya is "aksara". Hence "aksara" is Brahman. The Sruti first speaks of the Karma-Vidya, but then rejects it. For the material activities karma may be useful, which only gives transitory felicity but not eternal bliss. One who thinks this to be the ultimate reality, makes himself subject to a never-ending series of births and deaths. Deliverance cannot come to us by performing duties, but it is possible only by the earnest enquiry into Brahman under one who has already known it. This "aksara" is self-luminous and perfect, attributeless and all-pervasive. Thus "aksara" is Brahman and cannot be anything else.

The seventh Adhikarana of this Pada discusses a saying of the Ch. Up., that "Vaisvānara" is the perfect whole, is present everywhere, and it is to be worshipped. Other words such as "atman", "jiva", "hunger", "fire", "the god of fire", are also used in the same context. Hence the confusion. The popular meaning is of course fire, or the god of fire. It is said that the heaven is the head of "Vaisvānarātman". It is also said that fire is the eyes of Paramesvara, and there is given the "triloke-murti". Hence hunger or fire cannot be the object which is suggested here. "Vaisvanara" is said to live within man, but it is not like a man. The god of fire is also inadmissible because it has not the heaven as his head. Again from the derivative meaning—"Vaisvanara" is Visvanara—the soul of all men; and "agni" is ag-ni—one who gets the fruit of all work. The reason why Vaisvanara is in the small human heart, as explained by Badari and Asmaratha Muni, is that this Vaisvanara is Brahman, and thus spoken because Brahman is meditated in the heart of man as a finite being. Jaimini says that when the Infinite is so localised in a particular object for the purpose of meditation, the object no longer exists for the meditative mind, but only there remains a sense of the Infinite Being. It is for the gradual vanishing away of the duality that such "localisation" is at all mentioned. In the Jabal Up. also there is mention of the localisation of the Infinite Brahman to the nose and eyebrow. It is also said that the Infinite and Inexplicable one at the point between the eyebrows reveals itself to all as the ego-consciousness. Hence this Vaisvanara is Parmesvara or Brahman.

The third Pada begins with a declaration of the Mun. Up. In that Up. it is said that the heaven, the earth, the sky, the sense—all these have one locus; and one should know this locus, which is a bridge to cross this world. This locus, according to other thinkers is the Pradhana, or it may be the ether. But according to Sāṃkhya this locus suggests Brahman. The ana-

logy of the bridge may be explained as a substance which joins, and not as one which helps to cross over. The words "all-knowing", "all-pervasive" do not allow the Pradhana to stand for this "locus". The Pradhana is non-intelligent; the jivatman is half-intelligent, hence neither is suitable to stand for this locus. Thus judging the context as a whole, this locus, according to Śaṅkara is Brahman.

In the second Adhikarana Śaṅkara proves that "bhuma" denotes Brahman. The Ch. Up. declares that what is unrelational knows that, and what is unrelational whole, that does not allow duality and distinction, condition and finitude. But what is this unrelational whole? We know that speech is greater than name, mind than speech and finally prana which is greater than hope, which comes last in the series. This might suggest that 'prana' is this unrelational whole. Even in deep sleep prana exists, the senses cease their functions. This explains the saying that in the state of the unrelational whole nothing is seen or heard. This state is also happy because in 'susupti' sorrow and anxiety do not exist. That this "whole" is the immortal nectar is explained by the declaration of the Sruti that prana is the immortal nectar. But Śaṅkara shows that this unrelational whole is rather Brahman than prana. Because it has been said also, that this "whole" is beyond "samprasāda", whereas prāna is not beyond "samprasāda". Only Paramatman is beyond susupti. Prana is susupti but not something beyond susupti. Thus the "whole" is beyond prana. Hence the unrelational whole is Brahman. Moreover, the happiness in susupti is different from that in the "whole". The former is ephemeral, the latter eternal. The susupti is not immortal. Thus the unrelational whole or Bhumā is Parmatman and none else.

The third Adhikarana begins with the discussion on "aksara" which occurs in the Br. Up., where it is said that aksara is the locus of the sky. Śaṅkara shows that the

“aksara” does not mean the alphabet, though letters are worshipped. The sky is the locus of all things, and ‘aksara’ is the locus of the sky. Thus ‘aksara’ becomes the locus of everything. Hence alphabet it cannot be. It can neither denote the Pradhana, for it controls the sun and the moon, which the non-intelligent Pradhana cannot. Moreover, the Sruti declares that “aksara can see, but cannot be seen, it can know, but cannot be known.” The Pradhana has no such quality. Without this “aksara” there is no other thing. Hence the jiva cannot be this “aksara”. Thus “aksara” is Brahman.

The next Adhikarana proves that the “pranaba” mentioned in the Pr. Up. is Brahman; one who worships this “pranaba” goes to the Brahmaloka. But the journey to the Brahmaloka means the fruitful consequence of worship, thus it is only a finite gain. For this reason this “pranaba” should rather mean ‘aparā’ Brahman or the finite or saguna Brahman. But Samkara argues that the Up. continues to declare that the worshipper sees whom he worships, and this seeing is a peculiar experience of becoming one with the object of worship. This experience is not a finite sensible experience, but the inexplicable experience of the unrelational whole. It is true that the worshipper goes to Brahmaloka. But this is not the end of the journey. Even in this Brahmaloka one must continue his meditation, and in this loka he experiences Brahman. This Brahmaloka is not the end, but just a preliminary stage, which serves as a means to the experience of Para-Brahman.

In the Ch. Up., it is declared that in the Brahmapura there is the small lotus-chamber, in which is the ether which one should search out and know. This ether in the finite physical abode might be the gross ether which is limited in the chamber of heart. Or it might be the jiva, for the reason that Para-Brahman cannot be limited in a finite abode. Rather the jiva, who is a limited being, might be suggested here. Jiva is the owner

of the body, and he might live in the heart of his abode. But in this fifth Adhikarana Samkara, points out that this small ether denotes Brahman. The Sruti continues to say that this finite ether is all-pervasive and in it are situated the heaven and the earth. It is also sinless, diseaseless, immortal, free from sorrow, hunger and thirst etc. Such cannot be the ether. The body is called Brahmapura, because in this finite abode the Infinite is revealed. The Sruti also definitely says that the worshipper sees Para-Brahman within the body. All beings come to this Brahmaloaka everyday, but they are not conscious of it. So, the jiva also comes to this loka, and hence he cannot be the object. The object is something which is to be achieved by the jiva. Upon this finite ether the existence of the world depends, and also it has been declared that Paramātman controls the universe. Thus the finite ether denotes Brahman.

The sixth Adhikarana commences discussing the saying of the Mun. Up. that even the sun or the moon¹ cannot reveal it, but that it is self-luminous. But this is not a great luminous object. Brahman possesses eternal light. In the B. Pita the same has been declared. He is the revealer of all things, but himself is self-luminous.

The next Adhikarana goes on to discuss a problem in the Kath. Up. where is mentioned of a being short as the thumb what is luminous flame without smoke, and the creator of the past, present and future, and who is eternally existent. This at once proves that the jiva is not this being, because the heart of a man is so small, and the worshipper for his convenience might meditate at first upon the finite something. Thus this little being must be Brahman and nothing else.

In the fourth Pada of the first Adhyaya Samkara discusses on the word "avyākta" which occurs in the Kath. Up. This 'avyākta' said in the first Adhikarana, is not the 'avyākta' of the Samkhya system, which is the second 'Tattva' according to it. But this avyākta is the indescribable one. Here is mentioned

that the fighter has the body which is the chariot, intellect is the charioteer, mind is the reins, the senses are the horses, and objects of perception are the places where the horses run about. This fighter is Brahman. By *avyākta* is meant subtle body, from which comes out the gross one having name and form, which before creation, remains potentially in the *avyākta*.

In the second *Adhikarana* *Śaṅkara* points out that the 'mahat' of *Samkhya* is not the Vedic 'mahat' meaning 'unborn'. In the *Sruti* 'mahat' does not mean 'unborn'. This unborn denotes Brahman and not the *Pradhana*. The *Pradhana* is never *vedic*.

In the *Aran. Up.* it is said that the ultimate analysis of love brings in the conclusion that one loves his own self. When the self is known and loved everything is known and loved. But this self is not the individual self, but the Brahman. In the *jiva* duality and distinction are still there. It is declared that as the ocean is the ultimate destination of water, so Brahman is the ultimate destination of all things.

THE NEAREST ETERNAL (*The Ātman*)

It has been pointed out, that in spite of the opposition made by other schools of philosophical thought *Śaṅkara* has established that the omnipotent, omniscient, and eternal Brahman is the only existent real thing, and that it is the cause of all other things. Now *Śaṅkara* intends to prove that this only real entity Brahman resides in man.

The eternal Brahman is the nearest eternal. This nearest eternal is the *Ātman*. Not that amongst other eternals the *Ātman* is the nearest, but that there is only one eternal and that eternal is the nearest to us.

In the fifth *Adhikarana* of the third *Pada* of the first *Adhyaya* *Śaṅkara* says that as long as there is duality, so long there remains the *jiva*-consciousness. When this duality vanishes *jiva* does no longer exist, it goes beyond the body and the senses

and the Atman is revealed to itself. The finite ego-consciousness melts away into the consciousness of the whole. This is what has been called the rise of the jiva from the body. Until the pure knowledge dawns into the mind of the jiva, it cannot see the Atman in its own nature, which lives nearest to it, but takes it to be attributed with other gross matter. The transparent stone becomes coloured when placed near a coloured object. But one who has seen its transparency has known that its colours are mere super-impositions. Such is the case with the Atman. With the coming of pure knowledge ignorance vanishes, and the Atman is seen in its original transparency and purity. The Atman lives in a body but itself bodyless. The jiva shatters the false physical entanglement and comes out to realise that he is the Atman.

At the time of *susupti* or deep sleep the duality vanishes. The mind ceases to function because it does not perceive objects with the senses. But the Atman remains awake for ever. There is no mind at this stage because there is no relation between it and the body. Whereas the Atman which is free from any relational property is there always. There are many who think that the jiva is the ultimate reality. But this is not true. To remove such false knowledge is the motive of this Bhāṣya. Saṃkara points out that the Atman is the one eternal bliss, and as its power it has *Avidya* with it. This *avidya* it spreads to create a false notion of the many. In reality the many does not exist. The one seems to be many. The jiva, in fact, is the Atman. *Sruti* first accepts the jiva as a separate existence, and then shows that this jiva does not exist in reality as a separate existence, but what exists is the Atman which is omnipotent.

In the Ch. Up. there is mentioned the "super-light". This "super-light" is the Atman. The Atman cannot have any form that is why it has been metaphorically called light.

In the first *Adhikarana* of first Pada of the second *Adhyaya* Saṃkara proves that the *Samkhya* and *Yoga* are against the

Vedas. His arguments are that because the above two systems believe in the plurality of the Atman, and because the Sruti declares that the Atman is the one without a second, therefore the Samkhya and Yoga are not true interpreters of the Vedic truth. The same is true for the Vaisesika.

In the third Pada of the same Adhyaya Samkara discusses the nature of the Atman. The Atman is never destroyed or transformed. What changes or is destroyed is the body. The Atman has neither origin nor destruction. It is eternal; only the Atman expresses itself as the jiva taking names and forms. The Vaisesika says that the Atman is non-intelligent, and intelligence is attributed to it later. The argument is that if the Atman were intelligent, how is it that at the time of susupti the intelligence is no longer there. But it has repeatedly been said that Brahman is self-luminous. But Brahman is the Atman. In deep sleep the Atman is not conscious, is not true, because the Atman's unconsciousness is apparent and never real. As there is nothing to be expressed, so the Atman remains quiet. During sleep no other thing exists and the Atman again becomes the self-caused and self-luminous one. All duality vanishes and the Atman sees only itself.

In the fifth Adhikarana of the first Pada of the first Adhyaya Samkara says that in the Sruti there are not mentioned many causes of the world, the only one intelligent principle is the cause of the world. It is also said by the Sruti that all things known and knowable are born out of self. Thus the only one intelligent principle which is the cause of everything is the Atman.

The second Adhyaya is begun with the discussion whether this Atman is one or many. According to the Samkhya and Yoga schools there is the plurality of Atman, but Sruti never admits such plurality of the first principle. The first cause according to the Sruti must be one. So the Atman has no second. If the real is the only one intelligent principle there cannot be many "reals". For they either may be independent

of one another or relational to one another. In the former case there comes in contraction in regard to the first cause, in the latter the many has no real significance or claim for their separate existence. This Atman as has been said is intelligent. But the Vaisesika school says that at first the Atman is non-intelligent, and intelligence comes to it later. Thus intelligence is an attribute of the Atman, and it comes when the mind is in contact with the Atman. If the Atman were intelligent its intelligence would have existed even in dream or deep sleep; but that does not happen. Samkara points out that the Sruti says that Brahman is Atman, and Brahman is intelligent and self-luminous. So is Atman. Again, it is not true that during sleep the Atman is unconscious. The Atman is ever-conscious and intelligent. It is consciousness and intelligence as such. During sleep no other thing exists, and the Atman becomes as it is, without the apparent duality. Thus its unconsciousness and non-intelligence are just apparent. As there is nothing to be expressed, so it rather remains as unexpressed consciousness.

This Atman is neither born nor destroyed. The mind, the senses and the body, all belong to the "bhutas" and hence originate and perish like them. But the Atman has neither birth nor death. The Atman is eternal Brahman which expresses itself in the form of jiva. The many jiva is mere adjectival, the Atman only is substantive. But where does such an Atman reside to enliven the whole body? The Atman has no form hence no outline to distinguish its locality or position. A candle flame illuminates the whole room. But how does the quality of a thing go outside the thing? The whiteness of a white cloth cannot leave the cloth. But we might have other analogies. For instance, the fragrance of a flower is perceived outside the flower. The Sruti, however, declares that the Atman lives in the heart, and it is like a subtle atom, and from there it pervades the whole body for the reason that it is consciousness and intelligence as such. As heat and light are in the nature of

fire, so consciousness is in the nature of the Atman. The Sruti says that the Atman is knowable, and that it is atomic. It is atomic because when attributed with intelligence it becomes empirical, for the infinite one now becomes anthropomorphic when it has come in contact with the intellect. But where there is contact there must be separation; and there are times when the Atman is not with the intellect. When it is free from intellect, it becomes one with Brahman. Its contact with the intellect produces the ego-consciousness. Any kind of action, even meditation is the work of intellect. The Atman never does anything. It never becomes, but always is. In *susupti* and dream the intellect does not leave the Atman but remains in the background in a subtle form to appear again when awake. It remains a witness to all actions which are performed by the *antahkarana* in conjunction with the senses. The *jiva* has the ego-consciousness, and that is why it is an agent, a sufferer.

On the other hand liberation is cessation from work. If this work is empirical and thus unreal, so is liberation. Deliverance has no meaning in the world of reality. Bondage and deliverance are words for the empirical world. The empirical is the adjectival manifestation of the real.

But why at all this manifestation ?

THE LESSER ETERNAL (*Isvara*)

Samkara has already shown that the only real thing which exists is Brahman. But he then makes subtle distinction between Brahman and *Isvara*, stating that *Isvara* is no other than Brahman, it is Brahman attributed with qualities. Thus *Isvara* is an allowance for the empirical world to satisfy the anthropomorphic demand of the soul. In the Sruti it is found that two forms of Brahman are mentioned—the *Nirguna* Brahman and the *Saguna* Brahman. The former is qualityless the latter having attributes. *Isvara* is the *Saguna* Brahman. In regard to *Isvara* the Sruti declares: "The wise one who has produced

all forms and made all names exists in them." Men worship this Isvara and think themselves related to Him.

In the seventh Adhikarana of the first Adhyaya Saṃkara quotes the Ch. Up. where it is declared that there is a glorious being in the sun whose whole body is gleaming and whose eyes are like the petals of a red lotus. He then shows that such a being, as is seen from the sayings of the Sruti, is not attributeless; but it is Brahman who is now Saguna for the worshipper. Brahman puts on attribute so that the worshipper might meditate upon him. This Saguna Brahman is called Isvara. Isvara is thus a higher being, a means for the worshipper, an auxiliary in his attainment of the Nirguna Brahman. But such a means is no more than an illusion, for what is not Brahman is unreal and hence an illusion.

In the third Pada of the second Adhyaya Saṃkara shows that the jiva is dependent upon this Isvara. Isvara guides the jiva so that he might work according to his samskara. In spite of the potentiality in the seed, it cannot grow without the assistance of water. So though the jiva is bound by his karmaphala, yet without Isvara the agency of the jiva is not regulated. The Purvapakshin argues from the commonsense standpoint saying that the farmer can plough without Isvara but not without the bull. But this is mere argument. The teacher teaches but the pupil learns himself. If Isvara were to remain independent, the purusakāra and destiny of the jiva becomes futile. The relation between Isvara and jiva, on the other hand, is not like that of a master to his servant, but rather like that of the fire to its spark. It is declared by the Sruti that jivātman is part of Paramātman. Jiva is a part of Isvara.

One may object that if the jiva is a part of Isvara, then Isvara, like its part must experience sorrows and sufferings in a greater degree. And if liberation means becoming Isvara, it is no better than the worldly bondage. Rather worse than it. But it is not true. The ray which emits from the sun may get

deviated but this deviation is not in the sun. On account of the heterogeneity of the atmospheric air the sunray gets its deviation. On account of the duality of his ego-consciousness the jiva gets his sorrow. Isvara has no ego-consciousness, hence no duality. This ego-consciousness is inversely proportional to vicinity to Isvara. In the second Pada of the third Adhyaya Samkara again brings in the discussion and says that though the jiva is a spark of Isvara yet Isvara is not the jiva. For the jiva cannot create on account of his avidya. When this avidya is vanished the real reveals itself. It is generally said that the jiva also creates; for instance, the dream is his own creation. But this is not true. This creation is not a conscious creation. Had the dream experience been a conscious achievement, no body would have dreamt evil.

The Sruti declares that Brahman is Nirvisesa and Savisesa. The Purvapaksin argues that Brahman cannot be both, but must be either of the two. For is and is-not can never be both at once. Samkara says that as transparency and colour cannot live at the same time, but colour might be an illusion and in spite of its presence the fact that the object is transparent is not untrue. When the illusion vanishes, the truth reveals, that is all. In the Sruti there is an illustration of showing that Brahman is the only real substance, but Isvara is only for the purpose of worship. Once Bahva asked Baskali about Brahman and Baskali remained silent, showing that silence describes Brahman, for Brahman is inexplicable. When such a Brahman is spoken of in relation to categories and attributes, it is of Isvara that we speak. The Sruti sometimes speak of two existences of Brahman. The Murta Brahman, and the Amurta Brahman. The former is gross, and the latter subtle. The former includes three elements earth, water and fire. The latter includes two, air and ether. Both these denote Isvara, Isvara in His different modes of existence. The Saguna worshippers worship Isvara or God and the Nirguna worshipper Brahman. Of the two kinds of wor-

shippers the Sruti declares that the latter are wiser. The worshipper of Isvara gets Devajan, that of Brahman becomes Brahman.

According to Saṃkara the instrumental and material cause of the world is, Isvara. Isvara is omnipotent and omniscient. But none the less, this Isvara is no other than Brahman. As 'brāhman', 'ksatriya', childhood, youth, father, friend etc. are attributes of any man Devadatta, but Devadatta is what he is. So is with Brahman and Isvara. Thus in the second Adhyaya Saṃkara says that owing to avidya the difference between the bimba and pratibimba is forgotten. In the Paramarthic world Brahman is the only reality, and others, even Isvara is pratibimba. But in the Vyabharika world Isvara is the sum total of infinite attributes. The jiva has finite attributes while Isvara has all attributes. All attributes vanish in the realm of reality. There is neither 'bimba', nor 'pratibimba'. Thus, if Saguna Brahman is Isvara, then Isvara must work. The work of Isvara is different from that of man. That of Isvara is sport, independent creation. That of man is necessary consequences of saṃs-kara. It is the Saguna Brahman when he is a creator. Saṃkara says that He subdues maya and creates.

There is an objection that if Isvara is the cause of this world, and this world is full of inequalities, of good and evil things, so must be Isvara. But Saṃkara says (second Adhyaya, first Pada) that though it is Isvara who has created this world, yet it is not without any principle that He has created it. He creates according to merit. Hence, in spite of His creation inequality and discrepancy are not made by Him, but it is we who make them.

Saṃkara also says that Isvara can manifest Himself as an Avatār by means of maya. Such manifestation is a voluntary undergoing for the benefit of the worshipper (first Adhyaya).

THE EMPIRICAL ETERNAL

(The World)

We have seen that though Saṃkara has not accepted the world as real from the paramarthic standpoint, yet he has not denied its reality from the standpoint of the Vyabharika world. If this world of ours is empirically real, Saṃkara never discards it from his critical examination. First he declares that this world is an *illusion*, then he gives so much of his time and thinking in describing and analysing this illusion.

In the first Pada of the second Adhyaya Saṃkara discusses cosmology. All stones belong to the same earth ; so from one Brahman the different substances are originated. It may be objected that if at first Brahman alone existed where could he get material for his creation ? Saṃkara replies that no external material is needed in this case. As milk or water becomes curd or snow, so the world originates from Brahman. It may be argued that the milk gets heat from outside before it changes itself into curd. But unless the milk has the property of becoming curd no amount of the external heat can change it into curd. Brahman is all-powerful and perfect ; he does not require anything from outside for his creation. Taking the analogy further one may say that milk is non-intelligent whereas Brahman is intelligent. But Saṃkara replies that even intelligent beings like gods—create worlds. The spider creates its web if we take an illustration from the animal world. Another objection may be that the gods have bodies which they may use as material, whereas Brahman is bodyless. Saṃkara here points out a new fact. He says that this analogy rather illustrates the difference between a god and Brahman, than a resemblance between them. A god cannot create without some material from outside, but Brahman can create without it.

The Purvapaksin argues that if Brahman is formless, the whole of Brahman becomes the world ; and if the whole of

Brahman becomes the world, there remains nothing to enquire for, and the declaration "know him" of the Sruti becomes meaningless. On the other hand to call Brahman having form means making him temporal. The Sruti declares that Brahman is formless and more than the world, and one part of Brahman becomes this world. That Brahman is formless cannot be known by logic, but only by the Sruti. But how the formless Brahman has 'one part' for the creation of the world? Saṃkara explains that this duality is only phenomenal, an anthropomorphic explanation towards the understanding of cosmology. In fact there is nothing like cosmology in the Vedant. For the cosmos itself is not. The one Brahman creates the world of many without himself being changed. This may be understood from the illustration, that the one Atman creates many things in dreams without itself becoming many. In the Samkhya school the same difficulty is seen. The Pradhana is formless and yet it creates. So is with the paramānu of the Vaisesika. Hence, the objection against the creation of form by the formless does not hold.

In the next Adhikarana Saṃkara shows that according to the Sruti Brahman has infinite power, and because of this power there is infinite creation. The objection arises here, that if necessity is the mother creation, what necessity Brahman has that he creates? Brahman is perfect and free, hence he cannot have any necessity. Only the lunatic does anything without necessity, and Brahman is certainly not a lunatic. Saṃkara replies that Brahman creates because it is his nature. There is neither necessity nor any motive behind his creation. This creation is a spontaneous expression, sport or the "leela" of Brahman. It is not the fulfilment of a want, but the abundance of one who is always full.

But if Brahman is the creator of this world, why he creates such a world of sorrow and suffering and inequality? A creator of such a world must not be an imperfect one? Saṃkara

replies that Brahman creates it is true, but this creation is again subject to variation by the action of the jiva. This is the reason why there is inequality in this world. The cloud is the general cause for the production of the corn, but this again is not independent of the nature and quality of the seeds. Brahman similarly is the general cause, but the existence of inequality in the world is due to the particular cause—the nature and quality of the jiva. The Sruti declares that “Good acts beget good result, and bad acts beget evil.” Saṃkara continues his argument in the twelfth Adhikarana. He points out that, because there was one set before creation, therefore there was no cause for such inequality in the creation. This inequality comes later. Before the One became many there was no action, but in spite of that, this variability is possible, owing to the eternal nature of this world and the eternal nature of the action. Thus from the very beginning inequality and variation were there. But how to know that the world has no beginning. Because one cannot accept the fact that it has a beginning, for in that case the origin would be sudden. Avidya in conjunction with desires produces actions, and then comes the consequences. Not only the Vedānta, but the Smṛiti and the Purāṇas as well declares that the world is eternal. This phenomenal existence is, in spite of its being empirical, eternal. By making Brahman, the material as well as the instrumental cause of the world, the problems of creation can thus be explained.

In the second Pada of this Adhyaya Saṃkara again discusses how the world is caused by Brahman and not by the Pradhana. In the opinion of the Sāṃkhya the pot has the quality which the clay has. Now if this world is non-intelligent, its cause must be non-intelligent. Saṃkara replies that even from our everyday experience of life we never find anything which has a non-intelligent cause. The house, room, red etc. are the products of some intelligent being. The pot is made by the intelligent potter. The clay has the potter behind it which shapes it into

a pot. And so, even the non-intelligent Pradhana must have some intelligent cause. What of creation, even the desire for creation is not possible in the non-intelligent. The chariot does not move of its own accord. The desire exists where it is seen to be dynamic. It is in the intelligent being. But desire exists there where exists the body. Pure intelligence is bodyless, hence this world is not a product of his desire but of his creative impulse. The Samkhya might say that as water falls for the good of man, as the milk is for the good of the calf, so the non-intelligent Pradhana becomes this world. But the Sruti says that the water is caused to fall by some intelligent being, and the milk flows because of the wish and affection of the cow. The Pradhana is the harmonised condition of the three gunas—Sattva, Rajas and Tamas. Purusa is static. Hence the Pradhana is free only to act, the cessation from action is not possible for it. But Brahman being all-powerful and all-knowing may or may not act. If it is said that the Pradhana acts with a purpose, this purpose must be either liberation, or earthly enjoyment, or both. Liberation cannot be a purpose, for liberation exists all along. If we admit earthly enjoyment then liberation becomes impossible. The Purusa cannot enjoy as it remains indifferent. And both liberation and earthly enjoyment are impossible simultaneously. If in the act of creation the sight of the Purusa and the creative powers of the Pradhana are blended, creation would go on eternally, and hence deliverance would be impossible. The indifferent Purusa cannot create, the Pradhana itself is non-intelligent, and there is no 'tertium quid' to explain the creation of the Pradhana. But in the Vedanta there cannot be such difficulty as the conflict can never be between the real and the phenomenal. For creation there must be discord in the three gunas. But Samkhya does not allow any other element which would bring in this discord. If Samkhya admits that the gunas are sometimes in harmony and sometimes in discord, it must explain the cause behind such spontaneous breaking in the origi-

nal harmony. If now it allows consciousness in the Pradhana it also admits that creation depends on some intelligent cause. Moreover the Samkhya holds various opinions in regard to the elements. Some say that there are eleven senses, some say there are seven. Some declare that the 'tanmātra' originates from 'mahat,' some are of opinion that they originate from 'Ahamkāra.' Thus in regard to its discussion on cosmology the Samkhya is contradictory. What it points as similar contradictions in the Vedānta are of the empirical existence and has no concern with reality.

In the second Adhikarāṇa Saṃkara criticises the paramānu-vāda of the Vaiśeṣika. The Vaiśeṣika school argues that similar effect comes out from the similar cause. The white cloth is the product of white thread and not of black thread. Hence if Brahman is intelligent, this world of ours must be so, but that is not. In this case the world is not created by Brahman. But Saṃkara shows that in the Vaiśeṣika philosophy there is such weak logic. An atom has a volume, but when two atoms combine the volume is not doubled. According to the Vaiśeṣika there are four different kinds of atoms—earth, water, fire and air, and these are the ultimate elements out of which this world is created by combination. But Saṃkara now points out that these atoms were static before combination. What made them dynamic so as to combine with one another? The Vaiśeṣika admits that the combination is an act, then where is the agent? Saṃkara puts forth four different objections against this Vaiśeṣika cosmology :

1. As there was not yet the body hence not yet the mind ; therefore, the primal cause of this combination cannot be an attempt on the part of the Ātman.
2. Of this combination Fate cannot be the cause ; for Fate is non-intelligent.
3. If two atoms combine wholly the volume must in-

crease. If they combine partially, the atoms are allowed to have parts.

4. At the time of final dissolution the same difficulty arises—the want of an intelligent cause for the dissolution. Hence the atomism of the Vaisesika is not logical so far as the creation of the world is concerned.

The atomist says that the combination itself is an element which gives a new quality to the di-atom. But in that case, Samkara replies, 'combination' itself must have a 'cause'; and thus we admit an infinite regress. The atoms must be either of the following : dynamic, static, dynamic and static, or neither dynamic nor static. If dynamic, dissolution is not possible. If static creation is impossible. Both dynamic and static simultaneously is absurd. If neither, then dependent on some other cause.

Moreover the atoms have qualities and hence cannot be the ultimate cause of all things. The thread is the cause of the cloth and it is finer than the cloth; the fibre is the cause of the thread, and it is finer than the thread. Thus the ultimate cause must be the finest and most subtle. Whereas the atoms are never such. They have qualities which demands a cause for their own existence. In an atom there cannot remain an eternal substance, that the Vaisesika thinks or rather imagines, which is causeless. Again, the atomist discusses the problem of transitoriness. But that he should not, unless he admits something which is not transient but eternal. It is the demand of sound thinking that at the base of all evanescent existences there is something which is eternal. And this something is Brahman, who creates this manifold world. The world necessarily is an outcome of Brahman and not anything else.

To the atomists Samkara says that the element earth is the coarsest and has the qualities 'gandha,' 'rasa,' 'rupa,' 'sparsa'

and 'sabda.' Water being more subtle has the last four qualities, and so on with the other 'bhutas.' Should we then think that the atoms of these elements also differ in qualities? This then will mean that one kind of atom is more subtle than the other kinds. Again, we cannot say that each kind has all the qualities, in which case water should have the quality of smell. Hence atomism is illogical. Moreover this atomistic theory is not accepted by the Vedic Rishis. According to the Vaisesika the quality itself is a separate substance. But this is absurd. The quality expresses the substance. One quality begets another quality, and one substance produces another; but never a quality a substance or vice versa. The 'Samabāya' relation is not possible between a substance and its quality. Between the cause and effect there is 'Samyoga' relation, and not 'Samabaya' relation as such. The relation as such has no separate independent existence. Again, we should note that the entity like atom, mind, or atman has no bodies, hence samyoga is not possible. In fact, two bodyless atoms cannot make a substance having a body. Hence we are led to believe that the cause and the effect are but one. On the other hand, if the atoms are said to have bodies, then they must be subject to decay, for all bodies decay. Thus they cannot be eternal.

The fourth Adhikarana begins with the criticism against Buddhism. There are three schools of Buddhist philosophy :

- (a) Sarbāstivavādi,
- (b) Vijñānāstivavādi, and
- (c) Sarvasūnyavādi.

The first says that everything within and without is real. The second thinks that only the things within, that is the internal reflections, are real. The third school believes that nothing is real. According to the first there are four kinds of atoms (earth, water, fire, air) which combine to form this sensuous world. And there are five skandhas (rūpa, vijñāna, vedanā,

samjna, samskāra) which form the spiritual world. But the atoms and scandhas are non-intelligent, and there is no other intelligent being to cause their combination. Only perpetual creation may be possible, but dissolution and deliverance are not possible. Moreover it is not knowable whether there is any distinction between the perpetual flow of creation and that which flows perpetually, or both are the same. The Vaināsika Buddhist says that though they do not believe in any intelligent being, yet that does not stand against their believing in the eternal creative order. For these things which are born of avidyas are related to one another as cause and effect. Hence no external agency is needed for the going on of the world. But though the evolution of each avidya is possible, because one is the cause of the other; yet the combination of these avidyas is not possible, as there is no other cause which combines them to make other things evolve. And the avidyas themselves cannot be the cause of their combining with one another, for their own existence depends on the combination; and hence cannot be the cause of that which conditions their existence. If the combination is controlled by one definite law, then man would not be anything other than man. If there be no definite law man might change at any moment. If the enjoyer is transient, for him there cannot be anything for his eternal enjoyment, and thus no liberation.

It may be that there is cause for the creation of the avidyas but not the cause for their combination. Even they cannot justify how one of the avidyas is the cause of the other. Because each is temporal. One which perishes altogether cannot be the cause of that which comes out after its destruction. If the present one be the effect of the past something which is perished for ever, then Ksanavangavāda is discarded. On the whole, according to this view the effect is neither the same as the cause, nor something different. Hence it cannot explain the relation between cause and effect. Again, it cannot be said that the effect may

come without the cause, because it is said that out of four causes comes mind and its products. If it is admitted that the cause exists until the coming out of the effect in spite of its being transient, then its transiency vanishes.

The Vainasika says that 'pratisamkhyanirodh,' 'apratismkhyanirodh,' and 'akasa' are non-existent. The flow or the flowed one, neither of them can be non-existent, because they are causally related. One thing is said to change into another, and because both are mentioned simultaneously there cannot be any discontinuity between them. Liberation is the result of the destruction of the avidya. Hence it may be said that its non-existence is justifiable. But then the question arises : what is the cause of this disappearance of avidya? If the disappearance be spontaneous, then the advice to make it disappear is useless. If its disappearance is dependent upon a perfect knowledge, then the idea of natural transiency becomes invalid.

The ākāśa cannot be non-existent. In the Sruti it is told that akasa is born of Paramatman. Hence it is a substance. The sound has its locus in the akasa or ether. Moreover among the Buddhists it is admitted that air is conditioned by ether. Hence ether is a substance. Anything which is not a substance cannot be the cause of a substance. According to them these three are non-existent but eternal. A thing which does not exist, for it, there is no problem of its being eternal or temporal. Again, if we accept their theory of transitoriness memory cannot be explained. It is absurd to think that one man acts and the same man becomes another one when he remembers his action. In our remembrance we feel that the same I act and remember the action. The continuity of the ego-consciousness must be believed.

The Vainasika also thinks that the creation is from non-being. He argues that unless the milk ceases to be milk, curd cannot be formed. The seed perishes before plant comes out. But it is not possible for being to come out of non-being. From

absolute negation nothing can be born. In the above analogy though milk or the seed changes, yet they are the causes of the curd and the plant respectively. For neither the curd nor the plant can come out of nothing. There must be something as cause, from which other things come out as the effect. It is not, however, the fact, that the seed first becomes nothing, and then from this nothing grows the plant. The fact on the other hand is that the destruction of the seed, and the formation of the plant are the phenomena which occur simultaneously. Moreover, they first say that out of the four kinds of atoms, things are made, now they say that they are made out of naught. Hence contradiction : a farmer does not get corn when he does not till the field. If things were born out of nothing, a farmer would have got his crops without ploughing the field, and a potter would have got the pots without handling the clay. So is with the man and his liberation.

The Yogacari Buddhist thinkers say that everything is the product of internal consciousness. But this according to Samkara is absurd. There is the external world which is revealed in our consciousness, not that our consciousness produces the external world. In every kind of knowing there is the experience of an external object. Moreover, it cannot be said that what we experience is not an external thing, but only our own idea. The Vainasika says that we experience our ideas "like the external things." But how one is justified in saying "like external thing unless there is this external thing"? This at once proves that the object exists externally. Nobody has ever seen knowledge or the object of knowledge separately. But this does not mean that knowledge and the object of knowledge is the one and the same thing. There exists a relation between them which brings the other at once into consciousness when there is one. The Buddhist thinker accepts knowledge but not the knower. Hence it is absurd to have continuity in knowledge. Knowledge cannot be of a momentary existence, in that case it will be a

mere impression without an outline. The argument that consciousness is self-luminous hence there is no need of a knower, is false. The fire cannot burn itself. There must be an intelligent witness who knows, and becomes conscious of any object, and does not perish after existing for a moment.

The Buddhist says that the things of the waking state are as unreal as that of the dreaming state. But this for Samkara is not true. For after dream the objects experienced in the dream seem to be false. Whereas those experience in the waking life persist to be true. Dream is a kind of remembrance, but the waking life is a state of direct experience. Again, if the external objects do not exist, there remains no variety in experience, and hence no desire. But the Buddhist accepts the desire to exist. Without objects desire cannot exist. Or, to believe that knowledge is possible without desire, is irrational. Desire is a *samskara*, and cannot remain as such without an object, which is its locus. The ego-consciousness which is temporal and momentary cannot be the locus of the desire. The theory of the *Sunyavādin* is more futile than others, because it is against all proofs. The Buddhist theories on the whole are illogical.

In the fifth *Adhikarana* Samkara begins to criticise the *Vivasana* theory of the *Jaina*. This *Digambara* school believes, that there are seven substances—*jiva*, *ajiva*, and from these *asrava* etc. To each substance they apply the logic of *sapta-bhanganaya*. Unity, eternity, etc. are also treated with this logic. That is; in one sense it is unity, in another it is multiplicity; in one sense it is eternal, in another it is evanescent. But such, according to Samkara is absurd. One thing cannot be hot and cold at the same time. Is and is-not simultaneously is impossible. Moreover, an object which in one sense is and in another sense is not, cannot give validity in knowledge, rather it begets doubt—resulting in a hopeless scepticism. Hence this *astināstivād* is illogical. They say that the *atman* is as much as the body—*sarvaparimāna*. But the body is perishable and

changeable ; so according to them the atman is also perishable and changeable. Thus on the whole the doctrine of the Jaina philosophy is not logical.

In the next Adhikarana Samkara begins to examine the Saiva theory—that Isvara Siva is only the instrumental cause and not the material cause of the world. This, Samkara shows to be not logical. Because, if Isvara, creates bad, mediocre, and good beings he seems to be partial, and thus the conception is anthropomorphic. It is said that beings are such according to the merit of their work; then Isvara becomes limited and conditioned as well by the work of his created beings. Moreover, work is non-intelligent and must have some intelligent cause behind it, by which it originates. Hence it becomes absurd to think that Isvara and work are reciprocally conditioned. In the Samkhya there is no true relation between Isvara, the Pradhana, and the Purusa. Hence there is no chance of the Purusa becoming controlled by Isvara. In the Vedanta, on the other hand, there is the relation ‘abheda,’ and the relation of cause and effect. If the Isvara of the Samkhya is illogical, so that of the Pasupata. In the case of Samkhya, Samkara here again points out that, the relation of the potter and the pot is not applicable to that of Isvara and the Pradhana; because the potter and the pot both are subject to body. The relation between the Purusa and the senses is also inapplicable to that of Isvara and the Pradhana. Because the former relation is known by means of sorrow and happiness. But we cannot know the experience of Isvara. If Isvara’s experience is like that of the Purusa in that case there remains no difference between Isvara and the Purusa. Again, it is said that Isvara, the Purusa and the Pradhana are eternal. But how the three eternal can live without limiting one another? Moreover, how Isvara is all-knowing if there be no finiteness of the knowledge of the Pradhana? The other difficulty is that if there be restriction in regard to this number ‘three’, it means that the number condi-

tions the infinity of the reals, and in that case Isvara, the Purusa, and the Pradhana, each becomes finite.

The seventh Adhikarana begins with the criticism of the Pancharatra and Bhagavat schools. The followers of the Bhagavat say that Vasudeva is Paramatman and is the First cause, out of which 'samkarsana' or the jiva originates. Hence, according to them Vasudeva is Prakrte. But Samkara thinks that if the jiva has a definite origin, it means that it is essentially of the nature of ordinary perishable objects. This again means that deliverance is not possible for such object. Moreover, the objects for action do not come out from the agent. So 'pradyumna' or mind cannot originate from 'Samkarsana.' Neither 'Aniruddha' from mind. The Pancharatra admits, on the other hand, that Vasudeva, Samkarsana, Pradyumna, Aniruddha—each at first was in Isvara. Practically it comes to be four Isvaras, and that is futile, for the reason that one suffices. It is also illogical, because at another place it is said that Vasudeva is the one without a second. That the Pancharatra speaks of the four "tatvas" which are Vasudeva, is a statement which seems to be born of mere hypothesis. How is it known, asks Samkara that God has only four manifestations? We find in the Sruti and Smriti that the whole world is the manifestation of God. The saying of the Pancharatra, that the attribute and the attributed are the same, is against the scripture. The Pancharatra also abuses the Vedas. Thus their arguments are futile and illogical.

The third Pada of the second Adhyaya is devoted by Samkara mainly to the crude cosmological processes, of how the different elements came into existence. He begins with the ether. It is said by the Purvapaksin that ether is not created, for that is not mentioned clearly in the Sruti (except in the Tait. Up.). In the Vedas ether is compared to the eternal Brahman. According to the Vaisesika theory, again, there is no atom of ether. Hence ether is not created. But Samkara points out that if ether is compared to Brahman, Brahman and ether both become eter-

nal. To save from such a dualism it has been said that the ether remains in a mere potential state in Brahman, and that is not exactly its independent existence. As the expansion of milk does not stand in the way of that of the water in it, so is with Brahman and ether. That is why the Sruti says that ether is created. But the real fact is that ether is not created.

The above argument of the Purvapaksin is not justifiable. In the Sruti it has clearly been said that from Brahman the many is created. In the Ch. Up. it is declared that ether originates from Paramatman. If ether is not created from Brahman advaitavada does not stand. The real import of the Tait. Up. is also the same. Moreover, all created things have separate existences from one another. Ether also has its separate existence from the earth, water etc. Hence ether is also created. The argument of the Vaisesika, that because there is not ether-atom hence it is not created, does not hold valid. Because it is a fact that the combination of dissimilar things often forms a new thing. Again, ether is the locus of all temporal qualities, which means that itself is temporal too. The analogy that Brahman is like ether, is not for the purpose of establishing the infinity and eternity of ether, but that of Brahman. Hence ether is originated from Brahman.

The second Adhikarana has the similar arguments to prove that air is also an object of creation and is created from ether. The next four Adhikaranas prove that fire, water, and earth are also created. Fire from air, water from fire, and earth from water.

But these five "bhutas" originate not of their own accord; but it is Brahman, we must remember, who expresses itself through them, thus wishing to manifest itself into many.

In the eighth Adhikarana Samkara begins discussing the 'pralaya' or the final dissolution. He shows that as there is a regular order of evolution of this world, so there is a regular order of its dissolution. Thus, at the time of the 'pralaya'

the earth changes into water, water into air, etc. The senses, the mind, and the intellect—all these belong to the “bhutas,” and these also originate and perish like them.

The fourth Pada is devoted to the discussions in regard to the creation of the “prānas.” Samkara says that like the elements ‘prana’ is also originated from Brahman. The Sruti declares this. There are eleven “pranas,” which are declared by the Sruti. In regard to the number of ‘prana’ the Srutis differ, but when all these statements are taken together and weighed carefully the number eleven is justified. These eleven “pranas” are subtle and finite. Amongst these, the one is the principal. This principal ‘prana’ is according to Samkhya the action of the senses. Others say that the “prana” is air.

But both of them are wrong. The prāna is neither air, nor a resulting action of the senses. If it be air or a product of senses, its separate mention in the Sruti bears no meaning. Each sense organ performs its particular function, they do not perform anything in co-operation. Of them the prana cannot be the principal if it be the resultant action of all the senses.

Yet this prāna is not a separate entity and enjoyer different from the jiva. Like the senses, the prana is also a means to the enjoyment of the jiva. If the prana is a means to enjoying as the eyes are means to seeing, what might be its function? asks Samkara. He then replies himself that its function is to keep the body in a going-on order in harmony with the senses. The ‘prana’ functions different activities under five different designations as—prāna, apān, byān, udān and samān.

Now, another question arises here. Do the prānas work by themselves? Or work due to the presence of gods whose influence makes them work? The latter suggestion is correct. The Sruti declares this. Yet we should not forget, that though the gods have their influence over the pranas, it is the jiva who is the enjoyer. For jiva is the owner of the body. The gods have greater riches to possess than human body. They are

merely auxiliary to the senses ; the jiva alone is the enjoyer.

The principal prāna is a separate thing from other prānas. It is different from the senses, whereas other pranas are the senses. Unlike the other pranas, the principal prana works even in deep sleep. This the Sruti has declared in many places.

We have seen that Samkara elaborately discusses about cosmology. He not only discusses the how, but the why as well, of the origin of this world. He criticises the other schools of thought in regard to the problem of the first cause, and the function and freedom of the each detailed factor belonging to this world. But it is certainly a strange fact, that the world for which Samkara brings in so many arguments, is not at all real for him. According to Samkara this world is nothing ; it does not exist. It is just an illusion. Before he begins his *Sāriraka Bhāṣya*, he gives a preface, which is called the *Adhyasa Bhāṣya*; and in this he shows that the world is a product of *Adhyasa*—or error.

Samkara points out that in the totality of existence there are two divisions—Brahman and the other-than-Brahman. These two are antagonistic, as light and darkness are. What is light, is not darkness, and what is darkness, is not light. Thus what is *Atman*, is not non-*atman*. Hence the *Purbapaksin* argues that in this case *Adhyasa* is not possible. *Adhyasa* is a notion of a thing falsely posited on another. Hence, the thing of which the notion is posited must be already a fact of experience ; and the two things must have separate existences of dissimilarity to make the *Adhyasa* possible. But Brahman is not yet known, and so *Adhyasa* is not possible. The pearl and silver—which create *Adhyasa*, do both exist, and so do the snake and the rope. Whereas the yet unknown Brahman and the world cannot make any room for such an *Adhyasa*.

To this Samkara replies that it is not true that Brahman is not known altogether. Brahman may be unknown, but not unknowable. Many have directly experienced Brahman.

Moreover, the I has its locus the Ātman, which points to the fact that the I has a subject for knowing or experiencing. Hence it is not true that the Atman or Brahman is unknowable. Samkara then says that the Atman not only is knowable, but also can be experienced. The jiva finds it as the I. The Adhyasa is not limited to the field of perception, for even the sky is posited with the colour blue. Hence it is not true that the Adhyasa is impossible when the senses fail to experience the objects concerned. The sky which is not perceptible by the senses is taken to be blue, which in reality is not. So is with the self and not-self, or Brahman and the world.

This false knowledge due to Adhyasa is called the avidya, which is the root of all evil. To remove this avidya is the work of the Vedanta. One thing which is important to take into account, is the fact that in Adhyasa the posited quality does never stain the object underlying. Thus the world can never stain Brahman, the phenomenon is weak to leave its mark on reality. The rope, however much taken for a snake, never gets the poison in it.

The Purvapaksin then raises another objection. If, according to Samkara, only Brahman is real, and everything else is unreal, the scriptures then become unreal also. In that case how these are accepted by Samkara to be the 'pramāṇa'? Samkara here points out that the scriptures are not for Brahman but for man, hence they are nothing but the product of avidya. For where avidya does not exist, there exists not any necessity for the 'pramāṇa' and so for the scriptures. The scriptures are useful until the avidya disappears. The Adhyasa is the cause of the ego-consciousness which though empirical, is yet eternal.

THROUGH THE EMPIRICAL TO THE REAL

In the previous chapter we have seen that Samkara proves avidya to be the root of all evil, for it hides Brahman from us. Now about the removal of this avidya. When this avidya dis-

appears we have the deliverance. The jiva is Brahman but it cannot create because its divine qualities are concealed by the avidya. Karma is the fruit of the avidya, and Karma has its inevitable consequence. It is said by the Sruti that death is not the end of the 'life-process' of the jiva. Because after death the jiva takes with him the senses and the subtle elements. Every jiva must act, and every action of him is either good or bad, which has the corresponding consequence. The good actions of the jiva leads him to the "Chandraloka," from where he must return after the fruits of his actions are harvested, to be born again in this world. For bad actions the jiva, after his death goes to the kingdom of Yama, from where he returns also to be born again. Hence the absolute cessation of all Karma is the liberation for the jiva which means no more rebirths.

The Sruti says that at the time of sleep the jiva remains one with the Ātman. One may object that, supposing it is true that the jiva becomes one with Brahman when in deep sleep, is that the same jiva who wakes up again? A drop of water mixes with the water in the ocean and becomes one with the ocean; can the same drop be taken out? In reply Samkara says that the same jiva, who becomes one with Brahman in susupti awakes again. Because after the sleep the jiva recognises that he is the same agent who did such and such before he had fallen asleep. There is thus a continuity of ego-consciousness; that is why the personality does not alter after sleep. The Sruti thus declares that the jiva becomes one with Brahman everyday, but is not conscious of it.

Now, the analogy of water-drop. There the water-drop and the ocean are two different things before the union. But in case of Brahman and the jiva, they are not two different objects, but one; the jiva is Brahman. When Brahman is relational and adjectival, it is the jiva. But though susupti is a state when the jiva is with Brahman, coma is not.

The jiva must worship, must enquire into the nature of

reality. For this he must need at first something concrete upon which his anthropomorphic categories can be bestowed. For such ardent seekers after truth Brahma may be represented as Savisesa. Savisesa Brahman is Brahman with the attributes. This Savisesa Brahman is Isvara, whom the worshipper meditates. But none the less this Isvara is also an illusion. Only for the Vyavaharika or empirical existence that Samkara admits Isvara. But in fact only Brahman is the only reality. In the Sruti, it is said, that Bhaskali when asked Bhaba about Brahman, he remained silent, and pointed out, that this silence was the answer. This shows that Nirvisesa Brahman is inexplicable.

For the empirical world Brahman has two existences:

1. Murta, sthula, or gross,
2. Amurta, suksma, or subtle.

The former includes the three elements—earth, water and fire. The latter includes air and ether. All these are for the empirical world. The Yogin rises above these and experiences the absolute One, after the avidya being disappeared by meditation. In the process of meditating there remains the duality between the jivatman and Paramatman. But this ultimately melts away into an absolute Oneness. The Sruti declares that one who knows, he becomes. The distinction which remains for the knower is like that between the snake and its coil.

It is a fact that our experience of the empirical world is different and varied. This is due to the difference of intellect in the jiva. Thus intellect makes the existence adjectival. In the absence of this intellect plurality does not exist. Hence phenomenal world is due to this intellect. Intellect is finite, hence its product is finite. Sorrow and happiness experienced by the jiva are not given by Isvara, but these are the consequences of his karma. Isvara, the Sruti declares, distributes the due result of the done actions. He is only a passive distributor, never an interpreter.

Like the different acts of religious duties mentioned in the Vedas and the Purva Mimamsa, there are also different types of worship mentioned in the Vedanta. But the worship in the scriptures differ from one another. Yet the aim and end of each is the same. Thus the many types of worship are really the one worship mentioned in different ways. The worshipped being is one, hence the purpose of the worship must be one. In the Vedas it is said that there is the one being which is to be worshipped. To point out this unity, the same worship is mentioned in more than one Vedanta teaching. Each worship mentioned in the Vedas, is also suggested in the Vedanta. The Bājasaneya method and the method of the Chhāndagya are the same.

The attributes posited to the worshipped one vary in different Upanisads but if the real import is sought, there is found one purpose and meaning underlying all. The different attributes mentioned by the different Vedantists may be equally applied to Brahman. If one attribute is not mentioned in a particular place, it does not mean that it is not applicable to Brahman. On the other hand, attributes which are only relative or merely analogical are applied to Brahman for the purpose of worship.

In the Katha Up. there is said that the object is superior to the senses, mind to the object, and finally the Purusa. But this does not mean that the worshipper has the degrees of reality to be experienced. The Purusa is the only reality. The degrees, if admitted, must be in the empirical world. To become known of the Purusa means to become absolutely free from the bondage. For Purusa is the Atman.

The methods of worship differ because they are based on different attributes of Brahman. But in the Upanisads there are mentioned certain acts of religious duties, which Samkara points out are not to be confused with the worship. These are observances and not meditation. In the former, work is

primary, in the latter knowledge.

Another question which is discussed by Samkara is, that among the different kinds of worship, should the worshipper perform one or all of them? There are three kinds of worship :

1. Ahamgraha,
2. Tatastha, and
3. Angasrita.

The result of the first is the seeing of the worshipped. If that is fulfilled other two are not needed. One must be selected by the worshipper, that which suits him most. All of them together may prove harmful as they might destroy the concentration. But Tatastha worship may be performed in Samuchya, for each gives a particular result which make up the 'adrsta.'

In the fourth Pada of the third Adhyaya Samkara discusses the problem whether the knowledge of self is only a part of Karma or itself brings deliverance. According to Bādarāyana, it is not a part of Karma, but itself brings deliverance for the jiva. King Janaka is said to perform acts of religious duties with full knowledge. But this does not mean that the knowledge is a part of the religious duties performed by him. What does this mean, is that both work and knowledge are necessary for the jiva's liberation. Work alone or knowledge alone is neither possible, nor sufficient for having the deliverance. In the Sruti we find that a seeker after truth remains in the house of his 'guru,' and there he is to perform various duties, before he attains perfect knowledge.

But Samkara here says that though work seems to be necessary as it cannot be avoided, yet the Sruti always advises the jiva to discard work. The truth is known without performing such acts of religious duties. The agnihotra sacrifice is for having a hundred years existence, but the seeker of truth does not aspire for such a trifle thing as to have a hundred year life. The agnihotra sacrifice is for the layman who cannot enter into the inner meaning of the sayings of the scriptures. It is

true that many a Rishi performs acts of religious duties, but they do them without wanting the result. Thus, this Karma is 'niskāma.' The Sannyasa asrama does not allow Karma. Jaimini mentions only the Garhastha asrama in which the emphasis is upon the jiva's performing household and religious duties. But according to Badarayana there are other asramas which are important. For the last asrama, the Sannyasa asrama, what is essential is knowledge and not the acts of religious duties. In this asrama the jiva leaves all his socio-economic relationships, hence for him there remains no such things as the acts of religious duties. Here he practises meditation and enjoys quietude.

The stories of Jānavaalka, Dibdas, Pontrayana etc. which are mentioned in the Sruti, are not to advocate the performance of acts but just to show the importance of knowledge. These stories may inspire men to achieve knowledge and to enquire into Brahman. Knowledge thus is the cause of the jiva's deliverance. But though the result of knowledge does not depend on the acts of religious duties performed in the asramas, yet these acts are not useless. For they are means to knowledge. As wood is a means to cooking, so these acts to knowledge. These acts destroy sin and prepare the jiva to have the truth revealed in him. Thus, for the deliverance knowledge is necessary, and for knowledge work is necessary.

A worshipper must lead the life of a disciplined body and mind. He may eat anything he gets, just for the maintenance of his life. But wine is not allowed in any circumstances for any man. If one does not want deliverance, one is still to perform the duties prescribed in any of the asramas. Sama, dama, brahmacarya etc. are means to the preliminary conditions of mind achieved before the enquiry into Brahman begins. But it is better to remain in one asrama than to be outside of it. The poor and helpless cannot remain in an asrama and are not able to perform proper duties. But yet they may acquire knowledge, because by their acts of generosity and meditation,

which might be performed even from outside of any asrama, they can have knowledge. Sambata knew the truth by these means.

One who has adopted the Sannyasa asrama can no more adopt any other. The four asramas are in ascending order of merit. Badarayana and Jaimini both have disapproved descent in the order. But if the fall be unconscious there is no wrong in it. The worshipper must perform the worship himself, it cannot be performed by the priest or any other person on his behalf; because it is the worshipper who gets the result. This is what is said by Atreya. But in the opinion of Oudolomi the priest may perform the worship as he has been entrusted by the jiva.

In the Br. Up. it is said that purity of mind, childlike simplicity, knowledge and meditative nature are essential for the knowledge of Brahman. In the Sannyasa asrama 'sravan,' 'manan' and 'nididhyasan' are essential. For the Garhastha asrama 'ahimsa' and 'samyam' are essential.

Now, whether the jiva gets knowledge after his 'sadhana,' in this life or in the life after. The Sruti says that it depends on the jiva's karma. If the result of his karma is destroyed in this life, knowledge comes to him in this life. This means that as soon as the result of karma is destroyed knowledge comes. The result may be destroyed in one life or more. Hence the necessity for an intense desire for knowing the truth, and a passionate devotion in sadhana, which hastens the destruction of the fruits of work. The fruits of work are destroyed, but that of sadhana remains with the jiva even after his death in his succeeding lives.

In the whole of the fourth Adhyaya Samkara discusses about sadhana in detail. He points out from the Sruti that sravan, manan etc. are not to be performed only once, but repeatedly. Even meditation itself means continual thinking and concentration. The Atman is superimposed by the empirical

plurality, hence repeated hearing and thinking are essential for the gradual removal of the avidya.

For worship and meditation specific 'asanas' or sitting postures must be adopted. Lying position is not advocated because it brings in sleep. For meditation effortless sitting posture is the most suitable. In regard to time, duration, and place the principal point to be considered is the suitability for the concentration of mind. Meditation must be continued till death. Because the Sruti says that the state of mind at the time of death, is the state of mind which the jiva gets in the next life.

All sin is destroyed by the knowledge of Brahman, and future sin becomes impossible. "As cotton burns away in fire, so the sin in Brahmajnana." Not only sin, but virtue also is destroyed in Brahmajnana. "The wise becomes free from both sin and virtue." The Ātman remains no longer an agent, hence no work and no result of work. The knowledge of Brahman also destroys those karma which are as samskara, and not yet actualised at present. Those actualised in the present life are not destroyed, but continues to bring in result to the jiva. As the wheel in motion continues to move on even after the cessation of the propelling force, so goes the fruit of karma. Hence even after the knowledge of Brahman one has to wait for the destruction of the body, because otherwise deliverance will not come to one.

At the time of death first the function of the senses ceases and dissolves in mind. Then the psychical function dissolves in the vital breath. Next the vital breath into teja or the body heat. The body is left and the subtle body is taken, which is seen when the body-heat disappears ; for body-heat remains in this subtle body. The senses and the elements are dissolved for ever.

The knower leaves the body through the 'brahmarandhra' or the 'susumna-way.' He goes from this world to the Surya-loka, and after that to Brahmaloaka. There is no specified time

for such voluntary death ; any time may be suitable.

Different Sruti mentions different journey for the soul after death. But all journies end in Brahmaloka. The Devajān way is as the following : the journey is first to Agniloka, then Dibasaloka, Suklapaksa, Uttarayana, Sambatsara, Devaloka, Vayuloka, Adityaloka, Vidyutloka, Varunaloka, Indraloka, Prajapatiloka and finally to Brahmaloka. When the soul reaches the Agniloka, Agnidevata takes it to the next loka, and so on up to the Vidyutloka. From Vidyutloka to Brahmaloka, the soul is carried by the super-human beings or angels. But in Brahmaloka what the soul meets is not Brahman but Brahma. That is Saguna Brahman. The soul waits here until the final dissolution, when the Saguna Brahman with it merges into Brahman. This is known as the "Krama-mukti" or the gradual deliverance. But this Brahmaloka is not for the image worshipper.

What is the nature of this liberated self? Samkara gives the opinions of the great thinkers :

1. Jaimini says that the liberated self is absolutely pure and omniscient.
2. Oudolomi thinks that only consciousness is the essential characteristic of such a self.
3. Badarayana's opinion is that the liberated self is consciousness as such, and empirically it is omniscient etc.

The liberated self can wish, hence, Badarayana says that it has mind. Jaimini argues that if it has mind it must have the senses and the body as well. Badarayana finally argues to say that both are true—the liberated may possess a body and may not, according to its wish. The liberated 'self,' when it wishes it takes up empirical attributes, but never is it subject to birth and death. "Who goes by the Devajana returns not."

CONCLUSION

The easiest and simplest conclusion of Samkara's philosophy is that Brahman is real and all else is unreal. But the simplest sometimes has the rare gift of being the most complex. Such a complex philosophy is the monistic idealism of Samkara. Brahman is the only reality which is behind all these manifold existences. A human being according to Samkara is the Real, unconscious of its reality. The world is important only to find out its unimportance. But the mysterious relation between the Many and the One is not very clearly shown by Samkara. Many philosophers have given their opinion in regard to Samkara's philosophy. Max Muller finds that in the Advaita philosophy of Samkara there is no place for psychology and ethics. Others have tried to compare Samkara with Spinoza, Hegel, Schopenhaur and Bradley. But nonetheless we are forced to believe that Samkara is peculiarly unique on his own account. He discusses minutely the Empirical world, (believing all the while that it is unreal), to show that only Brahman is real.

That there is no psychology or moral teaching in the philosophy of Samkara is not true. The principal idea which is always in Samkara's mind is how a man can live happily and peacefully so that he may search after the Truth. And Samkara is never an atheist. In the category of thought God may reside on a lower level than Brahman, but spiritually God is not different from Brahman. If we are less severe in regard to the logic of Samkara, but carefully notice the psychological interest of his argument, we find that throughout his discussion there exists a calm but convincing spirit of one, who has a concrete spiritual entity before his mind, which alone is real. This spiritual entity is concrete, and so never a naught. But yet there are two Samkaras: Samkara the intellectualist and Samkara the intuitionist. The intellectualist Samkara fails to reconcile the many with the one, the intuitionist Samkara needs not the reconciliation.

Deussen believes that there is an absolute antagonism between the world and Brahman. That is, if the world is Brahman is not, and if Brahman is the world is not. But if one studies Samkara one finds that there is no such absolute antagonism between the two. What is true is that this world cannot be without Brahman, though its existence does not give anything to the Real. This world is either real or unreal. If it is unreal it may be an illusion or a hallucination. According to Samkara this world is not real. It now depends on the critic to take this manifold existence as either to be an illusion or a hallucination. For Samkara this world is rather a hallucination than an illusion. But yet this world according to Samkara is never unnecessary, and he devotes most of his energy and attention to defining its very many details. The Vyavaharika world is unreal, yet Samkara devotes much of his time to discussing it. We may say that it is like the study of a disease by the student of medicine in order to remove the disease. Thus the "two orders of knowledge", using the phrase of Dr. Urquhart, are not unrelated. But rather there exists a relation which is like the relation of the body and the soul.

Some philosophers, like Mr. K. Sastri, believe that the world according to Samkara is the real self-expression of the Absolute. Thus the world is not a mirage. But this is perhaps a little toning down of Samkara's position. The unreal cannot be the real self-expression of the Absolute. To be such the Many becomes as real as the Absolute One. From this position it is not very far to say that nothing is unreal whatsoever. Samkara also discussed degrees of existence. But these degrees always belong to the Empirical order of knowledge. The "akaskum," "sukti-rajat," and "nām-rupa" groups of existences all belong to the Vyavaharika world; though Samkara divides them as "alika," and "asat." But we should not forget that the "asat" is as unreal as the "alika". The husk of a cocoanut is certainly unreal to one who is after the kernel. Yet one must

pierce through the futile husk to get at the kernel. Similarly, according to Samkara, one must get through the unreal in order to reach the real. The getting through the unreal is essential. But, continuing with the analogy, we may ask what about the whole cocoanut? The whole cocoanut must be the Absolute which should give place to and explain the two order of existences—empirical and real. Samkara never explains why the Unreal Many hides the Real One.

It is very natural to compare Samkara with Hegel. But the two philosophers are altogether different. The 'dialectic' of Hegel which is an eternal process towards the Real, is quite different from Samkara's approach to the Real. The "kosas" which Samkara speaks of, are limited to the Empirical reality. The "Anandamaya Kosa" is not the synthetic consequence of the "Vijnanamaya Kosa." The Anandamaya according to Samkara is altogether transcendental. The Vijnanamaya may be spiritual but never a kind of a lower grade of reality. According to Hegel "Where there is no definite quality, knowledge is impossible. Mere light is mere darkness." But according to Samkara "mere light" is the 'only light.' The former is a logical conception, while the latter is an intuitionistic conception. Hegel himself calls Brahman to be "a characterless nothingness." Edward Caird calls it to be "an abyss of a negative infinitude." Pfeleiderer says that Brahman is not "the positive ground which produces and maintains the finite." But one should not forget that Hegel himself says also that "the truth is that there is only one reason, one mind and that the mind as finite has not a real existence."

What is evident from the western attitude is that these philosophers do not go beyond the anthropomorphic categories. Whether the going beyond them is justifiable is another question. The Indian philosopher, on the other hand, always aspires after the going beyond anthropomorphic categories. The conception of the Real without activity is certainly something more than human.

But the range of anthropomorphic categories has no limit. The spiritual values which contain all conceptual and ethical norms are, as Hermann Siebeck, points out, "over-world contents." The "Over-World" is the realm of values. But yet this "Over-World" is not beyond anthropomorphic conception. By anthropomorphic we mean all ideas which bear the character of human self. In this wider sense even the *Geistesleben*—the life of the spirit—of Eucken, and Troeltsch's "Secret Ground of the Universe," are not beyond anthropomorphism.

To the question: Can we go beyond anthropomorphism? the Indian philosopher replies Yes. For Samkara the anthropomorphic existence is not real but only empirical. The human values according to Samkara are empirical values. But yet, from the human to the divine there cannot be any gulf. Samkara never says anything of the mysterious bridge between the two.

But there are some contemporary Indian philosophers who believe that the human is not altogether human, for the reason that it can force the divine to come down to raise itself. A machine never questions itself. A man who questions his manhood is something greater than man. The eternal aspiration to go beyond anthropomorphic conceptions is not anthropomorphic. The Empirical world may not be real, but yet we disagree with Samkara to think it to be an illusion. The Empirical order of existence is not purely subjective. The meaning of it might change, the significance might alter, but yet it has its own validity. One who has experienced Brahman, for him also this world exists, and he has to deal with it.

The real we believe is absolute and concrete and it has degrees of manifestations. Hence nothing is absolutely unreal, for the reason that everything helps explaining the Real.

SECTION IV
SANSKRIT

THE SYSTEM OF LAND-TENURE IN ANCIENT INDIA

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From the dawn of civilization, it appears, that the real ownership of land has been assigned to the King or his numerous substitutes. Bhu-pati or the 'land-lord' or the equivalents in different languages are an early epithet of the King who may come into its possession and ownership by conquest or otherwise. Thus the gift of land could be made by no other person except its real owner, namely, the King. He may transfer right over the land wholly or partially. In other words, the King gives away a part of his sole right over the land to certain persons who occupy and use it under certain specified or unspecified conditions. Unless a King's sole ownership is wholly transferred, that is, if one King does not make room for another King, which seldom happens, the real ownership is retained by the King himself. When an orange, for instance, is given or sold by *A* to *B* without a clear specification of the conditions, it would not be clear if *B* could claim the ownership of a new plant grown out of the seeds of the fruit given by *A*, because in the gift of an orange what is actually given is the right to eat the juice of it, and not necessarily its seeds or skin. Similarly in transferring land when is actually sold or given away is the right to build upon or to cultivate. If perchance a mine of gold, silver or other metals be discovered at a lower level than the cultivatable surface the ownership thereof becomes a matter of dispute. Again if a land be given away wholly, the new owner may not

allow the King to arrest a thief, for instance, if the latter takes shelter out of the King's jurisdiction. Thus the grandee, however small his holding may be, may in effect become like a free and independent state of the modern world. A free kingdom within another free kingdom cannot be constituted. Consequently in transferring land the King never parts with his real ownership.

For non-religious purposes such a practice is tolerable. But in cases of spiritual gift if one does not part with all his rights the gift loses its spiritual benefit. The solution of this difficulty was attempted in various ways probably in no other countries than in India. We may examine some of these endeavours both for knowledge and guidance.

There is a very familiar passage in the Mahābhārata which has been often quoted as an authority in praise of land-grant, where, incidentally, the King's sole ownership of land has been acknowledged without any doubt or ambiguity: 'And it has been said by the venerable supreme sage, the arranger of the Vedas,—“O Yudhisṭhira, best of Kings, carefully preserve land that has previously been given to the twice-born; (verily) the preservation (of a grant) (is) more meritorious than making a grant! The earth has been enjoyed by many kings, commencing with Sagara; whosoever at any time possesses the earth, to him belongs, at that time, the reward (of this grant that is now made, if he continue it)! The giver of land enjoys happiness in heaven for sixty thousand years; (but) the confiscator (of a grant), and he who assents (to an act of confiscation), shall dwell for the same number of years in hell!”’¹

The system of endowment was no doubt common before

¹ Ukam cha bhagavata pa-ram-arshinā Veda-vyāsenā Pūrvva-dattam dvijatibhyo yatnādrakshya (ksha) Yudhisṭhira mahi (hī)m mahimatām sreshṭha dānach-chhreyo nupalanamm Bahubhir-vvasudhā bhuktā rājābhiḥ Sagar-adibhiḥ yasya yasya yadā bhūmis-tasya tasya tadā phalam. Shasṭim=ba(va)rsha-shastāni svargge modati bhūmi-daḥ āchchhettā chānuma-nta cha tānyeva narake vased=iti.

and after the period of the great epic. In fact all Buddhist institutions including monasteries, colleges, Universities, as well as the Brahmanical, Jain and Buddhist temples and their maintenance were possible because of the liberal endowments made both by the ruling kings and private individuals. There are stories in the Jātakas where land for the purpose of gift is stated to have been measured by spreading coins over it. The object of this short article being to illustrate the system of land-grant only, the wider question of other endowments and their method, principle and effects upon the society must be necessarily left out here.

In the literature of the Mauryan period there are casual references to land-grants. But in the Asokan edicts as also in the numerous endowments made from the beginning of the Christian era especially by the Kushan kings, their chiefs, and their consorts, there is no elaborate reference to the system of land-grants. In fact even in the Gupta period, from third to the fifth centuries of the Christian era, the references to land-grants are so meagre that no definite conclusion can be convincingly made regarding the actual laws regulating such gifts. The first conclusive reference is made in an inscription of 475 A.D. in connection with a grant made by a Parivrajaka King, Maharaja Hastin: "By the Maharaja, the illustrious Hastin,—who is born in the family of a kingly ascetic; who is the great-grandson of the Maharaja Devadhya; who is the grandson of the Maharaja Prabhanjana; who is the son of Maharaja Damodara; who is giver of thousands of cows, and elephants, and horses, and gold, and many lands; who is earnest in paying respect to (his) spiritual preceptor and (his) father and mother; who is extremely devoted to the gods and Brahmans, who has been victorious in many hundreds of battles; (and) who causes the happiness of his own race.

(By him),—for the purpose of increasing his own religious merit, (and) in order to cause (himself) to ascend by the steps

of the ladder that leads to heaven,—the village of Vasuntara-shandika is granted to the Brahman Gopasvamin, of the Vājasaneyā-Mādhyaṃdina (sākhā) and the Kautsa gotra, and to Bhavasvamin, Sandhyaputra, Divakaradatta, Bhaskaradatta and Suryadatta.

On all sides (there are) trenches (of demarcation), (and) on the north by the west, the boundaries are those that have been previously enjoyed. (This village is made the property) of Sandhyaputra and the others, with the *udranga* and the *uparikara* (and with the privilege that it is) not to be entered by the irregular or regular troops ; (but with the exception of the right to fines imposed on) thieves.”¹

The essential general characteristics of such land-grants are common in all cases. The present example is not quite a typical one but it is about the earliest. It should be noted that the genealogies and the identifications both of the donor and the donees and the land are invariably mentioned. The object of the gift is twofold. The endowment is made by the owner of the land for the religious merits of himself and his parents. So far as the donee is concerned the land is given to him either as a reward for his past deeds, or with a view to enabling him to perform religious observances without any distraction often caused by economic and other difficulties, or to perform certain religious rites like the worship of an idol, supplying oil for burning of lamps before it, or to feed daily a specified number of religious or poor persons,² or as in the present instance, without any condition. But under whichever condition the gift is made the religious motive of the giver is common. And in order to make the gift as absolute as possible it is specified that the property is given with “Udranga and Uparikara” and not to be entered into by “Chāṭa and Bhāṭa” except in connection

¹ Khoh Copper-plate Inscription of the Maharaja Hastin (Corpus Inscription Indicarum, Vol. III, pp. 93-100).

² Vide the examples quoted later.

with thieves (*chora-varjjam*).

Before attempting to explain the significance of these rules it will be convenient to further examine similar rules in other and later inscriptions, the other conditions and process of gift-making being similar if not identical.

Maharaja Hastin made such gifts in the years A.D. 482 and 510 also, but with the same conditions. His successor Samkshobha also granted lands in the year A.D. 528 "for the purpose of increasing the religious merit of his parents and himself, at the request of Chhodugomin and with the object of causing him to ascend the steps of the ladder that leads to heaven, half of the village Opani, by a copper-charter with the exception of thieves and mischief-doers (*chora-drohaka-varijjam*) for the purpose of observing the Bali, Charu, Sattrā, at the temple which he has caused to be built of the divine goddess Pishtapuri, and for the purpose of renewing whatever may become broken or torn."¹ In this quotation, it should be noted, that only half of a village is given and thus it could have no natural or recognisable boundaries and that an absolute gift of such land would be impossible. Besides, the gift was made at the request of the donee, who undertook, on behalf of the king, to perform daily certain religious rites to the installed deity and to carry out annually the necessary repairs of the temple. Thus perhaps the inaccessibility by police or king's soldiers was dispensed with but the treatment of the thieves was retained by the kings.

The Maharajas Jayanatha and Sarvanatha of the Uchchakalpa dynasty made similar gifts in the years A.D. 494, 497, 513, 517 and 534. In the first of these epigraphs the rights made over were the same as in the first instance of Maharaja Hastin. But in the inscription of A.D. 497 it is laid down that "with the exception of fines imposed on thieves, the tribute of the taxes which by

¹ Khoh Copper-plate Inscription of the Maharaja Samkshobha, *ibid.* p. 113-116.

custom should (not) belong to the king should not be taken.”¹ The specific mention of ‘fines’ here makes the common condition, ‘chora-varijjam,’ clear. The king’s dues as taxes appear to have been exempted here. The Maharaja Sarvanatha of the same dynasty made it further clear that the gifts could be made separately to different parties, and not to Brahmans alone, and that the villager should treat the donees as their new lords : “Be it known to you (villagers) that this village is allotted by me in four shares.....two shares to Vishnudandin, another share to the merchant Saktināga, and another share to Kumāranāga and Skandanāga,.....to be enjoyed by them and by their sons, sons of sons’ sons, sons of the latter and so on (for ever). It is agreed by them and by me that it is given for the repairs, by the above-mentioned succession, in order to increase their own merits.....and for the maintenance of the Bali, Charu, Sattrā, perfumes, incense, garlands, and lamps.” It is enjoined to the villagers “you yourselves shall render to them the offering of the tribute of the customary royal tributes, taxes, gold, etc., shall be obedient to their commands.” It is further stated that the king “being in good health issues the (above) command to the cultivators.”²

This passage supplies some new information regarding the terms of the legislation. The one of the donees was not a Brahman, but the religious rites mentioned could be performed by a Brahman only. Thus it appears that the donee held an intermediate right. The other point is that the villagers were asked to transfer all their allegiance to their new lords. Further, in order to make the gift valid the donor must be in good health.

The only other points left to be supplemented are the occasions of making the gift and the registration of the deed of transfer and giving of the possession by some high officials.

¹ Samuchita-rājabhavya-kara-pratyayana-grāhyāḥ chora-danda-varijjam. (Khoh Copper-plate Inscription of the Maharaja Jayanatha, Ibid. pp. 122, 124.)

² Ibid. pp. 128, 129, 132.

These necessary amendments to the law were perhaps found necessary by experience and were carried out later. Thus it is stated in a subsequent inscription of the Maharaja Sarvanatha that "This charter has been written in the year A.D. 517 by the Mahāsandhivigrahika (lit. the prime minister of peace and war), Manoratha, the grandson of the Bhogika, the Amātya Phalgudatta and the son of the Bhogika Varahadinna. The Dutaka (who conveys the deed of gift, perhaps under whose authority the deed is registered in some way) is the Mahabalādhikṛita (commander-in-chief of the royal army) Siva Gupta." There is stated to be another Dutaka: "Halir-ākara-kumbha-daṇḍa-pratimochanātilekhane-pi-dūtakaḥ uparika-Māṭṛisivaḥ."¹

This last sentence implies some new ideas which are, however, not quite clear. But the expression 'ākara' which means 'a mine' may be a clue to the ideas intended to be implied. And the adjective 'uparika' before the 'dūtaka Matrisiva' may incidentally supply the clue to the term 'uparikara' used above together with 'udranga' which income or taxes received out of the land given are retained by the king. Thus the missing ideas may be that a special officer assesses the value of the property when some unforeseen treasures or mines are discovered underneath the ground, which are not ordinarily given away with the land. This interpretation appears to have been made clearer in the Maliya and Alina plates of the Valabhi Kings, Dharasena II and Siladitya VII, of the years A.D. 572 and 767. In both these inscriptions it is stated that the land is given "together with 'undranga' 'uparikara', vāta, bhūta, dhānya, hiraṇya, ādeya, and with the right to forced labour as the occasion for it occurs and with the privilege that it is not to be even pointed at with the hand of undue appropriation by any of the king's people." It is here made further clear that the donee may use the gift of land in any way he likes: "Wherefore, no one should behave so

¹ Ibid. p. 134.

as to cause obstruction to this person in enjoying it in accordance with proper conditions of a grant to a Brahman and cultivating it, or causing it to be cultivated, or assigning it to another.”¹ The above ideas are still more clearly elucidated in Arang Copper-plate of Raja Mahajayaraja and the Raypur plate of Mahasudevaraja where it is stated that “this village is to be enjoyed as long as the world endures together with its hidden treasures and deposits ; not to be entered by the irregular or the regular troops ; and exempted from all taxes.”² The Chammak Copper-plate and Siwani Copper-plate of the Maharaja Pravarasena II contains the passage “Now we grant the fixed usage, such as befits this village. It is not to be entered by the regular troops by the umbrella-bearers ; it does not carry with it (the right to) cows and bulls in succession (of production), or to the abundance of flowers and milk, or to the pasturage, hides, and charcoal, or to the mines for the purpose of salt in a moist state ; it is entirely free from all (obligation of) forced labour ; it carries with it the hidden treasures and deposits, and the *klīpta* and *upaklīpta* ; it is (to be enjoyed) for the same time with the moon and the sun ; (and) it is to follow (the succession of) sons and sons’ sons. The enjoyment of it should not be obstructed by any one. It should be protected and increased by all (possible) means. And whosoever, disregarding Our charter, shall give, or cause to be given, even slight vexation, We will inflict on him, or will cause to be inflicted, punishment, together with a fine, when he is denounced by the Brahmins.”³ Lastly in the Rajim Copper-plate of the Raja Tivaradeva a village is given together with all the privileges of Provarasena’s plates accompanied in addition “by the right of ‘*dāradraṇuka*’ and all the taxes.”³ It is concluded with the statement that “Being aware of this, you should dwell in happiness rendering to them in

¹ Ibid. pp. 166, 170-171, 179, 189-190.

² Ibid. pp. 194, 195, 198, 199.

³ Ibid. pp. 242, 249.

proper manner their share of the enjoyment.”¹

In these inscriptions this is stated to be the law of land-grant (Bhūmichchidra-nyāya). The present law is no doubt more clear regarding the rights, privileges and obligations of the tenants. But the assumption made in certain quarters that the tillers of the land should be its real owners is not supported by historical facts as shewn above. Nor is it based on common-sense because such an assumption would be as unsound as the ownership of the cow being given to the cowherd, or a chauffeur being made the owner of a car, or a cook being the owner of the cooked food. In each of these instances the labour put in is paid for. If by any perverted reasoning the tax-collectors be made the owners of the revenues collected the state would become bankrupt and there would remain no revenues to be collected, no cars to be driven, no cows to be milked, and no food to be cooked.

¹ Ibid. pp. 295, 299.

SECTION V
HINDI

श्रीजानकीवल्लभो विजयते
 दिव्यपद्माभिः संप्रेतैः स्थापयति माश्रितासद्दिदृष्टपितु
 दिव्योपमाहर्षयामाप्रता॥१॥ तुलसी जान्ता दशमर्षिद्व
 नमुनसत्यसमाना मुतजोनिहलागिविनुतामपि ह्येप्राना॥
 चाम्पौ तयति नाथमस्मत्तयति नानृतं॥ क्षमाजयति नकोप्रो
 वेदं नयति नासरा॥॥

(Faint handwritten notes in Devanagari script are visible in the right margin, including phrases like 'महाराज', 'श्रीगुरुदेव', and 'सर्वभूतहिते')

THE HANDWRITING OF TULASĪDĀSA

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There are seven different specimens of handwriting, each of which is ascribed to Tulasīdāsa. A brief discussion of these will be interesting.

A. There is a Deed of Arbitration dated 1669 V.E. (1612 A.D.) dividing the property of one Tōḍara deceased between his son, and a grandson of his from a deceased son. This is now in the private possession of the Maharaja of Benares State. The first six lines in this deed are said to have been inscribed by the poet.

The sources of this deed are reliable. It was in the possession of the successors of Tōḍara for quite a long time, till it was handed over to a predecessor of the present Maharaja of Benares State in return for a subsidy. Chaudhari Lal Bahadur Singh, the present successor of Tōḍara enjoys this subsidy. Tōḍara was a neighbour of the poet. The house of his successors still stands near the Asi Ghat. Lal Bahadur Singh distributes food on the 3rd of the dark half of Śrāvaṇa in memory of the poet's death. He says that he has seen his father and grandfather also distributing the food on the same date, and that he was told by them that they had inherited the custom from their forefathers. This shows that the relations of the poet with Tōḍara and his family were intimate. Therefore, it is not improbable if the poet should have inscribed the first six lines in the deed.

This deed is written on light-brown country made paper in dull carbon ink. The paper is thin and worn out. It has been very recklessly pasted on a thicker paper and folded. It is

due to this reckless handling of the document that the lines do not appear to be regular near the margins, and many of the letters have been deformed there. This, however, is a most valuable document, and contains probably the only authentic autograph of the poet. In the discussions that follow the first six lines of this document will be called A.

B. There is a MS. of the Uttarakāṇḍa of the Vālmiki Rāmāyaṇa, dated 1641 V.E. (1584 A.D.). This has been copied out by some Tulasīdāsa, as is evident from its colophon. It is now deposited in the Sarasvati Bhavana Library, Benares.

We have now no knowledge of its original source or sources. There is a *śloka* written below the colophon which is very material from this point of view. It reads as follows :

Srīmadyēdila śāha bhūmipa sabhā sabhyēndra bhūmīsura
 Śrēṇi maṇḍana maṇḍalī dhuri dayā dānādi bhāji prabhuh:
 Vālmikēh kṛtimuttamām Puraripōh puryām purōgah kṛtid
 Dattātrēya samāhvayō lipi kṛtēh karmatvamācīkaran.

‘One who is the greatest among the members of the Court of the King Edilshah, and who is an ornament to the assembly of the Brāhmaṇas, and its axis, and the head of the Board of Charity, and whose name is Dattātrēya, he got the work of writing this excellent work of Vālmiki done in the city of the enemy of Pura.’

Evidently, the poet Tulasīdāsa could not have been made to do the work of writing the Rāmāyaṇa of Vālmiki, a big work as it is, for any consideration, especially when his Rāma Carita Mānasa, a supreme work in vernacular on the same theme, had already been published eleven years before. In those days of the revival of Vaiṣṇavism, Tulasīdāsa must have been a common name, and it would not be surprising if we find this Tulasīdāsa different from the poet Tulasīdāsa.

The MS. is in a good condition. The paper is white-brown. The ink used throughout the MS. is carbon ink, except the colophon which has been written in red

कामदेवाश्च यः पठेत्तापान्नापि सदा कुर्वन्समाप्नोति विष्णोः प्रसादान्महतीं सत्त्वाश्च न्यायिकान्
 धिः प्रपन्नोऽपि राजानेति देशेषु मलिन्योऽवस्थाप्य साध्यामंशुभावेनोच्यते भूमीकृतवत्सलमोक्षदीपान्
 ब्रह्मात्मज्ञानसमाप्नोति देवैर्वाच्योक्तं दास्येमांस्तदुच्यते सर्वदा पठते पृथक् पृथक् कामसुखं च तिर्यगता
 त्वानभवाय सः विद्योन्नरं दिग्गजं तवास्वर्गाभिधीमानं ब्रह्मदेवाश्च यद्वर्णयन्ति ॥ इत्येवमपि योगिनाम्
 जो देवैर्वाच्यमिहास्त्वस्मिन्निष्ठायां पुनरपि काव्यं स्वर्गादिनां भूषणम् ॥ अथ भक्तयोः ॥ समा
 लवेदमहाकाव्यं श्रीरामायणमिति ॥ तारकादिह ॥ नमस्तस्मात्पुनरिदं वा ॥ सुलसीदासः ॥
 श्रीमद्योगेश्वरः भूषणः पञ्चमः ॥ इति श्रीमद्भक्तियोगोक्तं ॥ इति श्रीमद्भक्तियोगोक्तं ॥ इति श्रीमद्भक्तियोगोक्तं ॥
 मुनिमोक्षरिपोऽयं पुरोगमः इति ह्यत्रैयं समादृतो विपिद्वैतैकमसिद्धीकरः ॥ २॥

B. The last page of the Vālmīki Rāmāyaṇa MS. (1641 V.E.)

ink. The *ślōka* below the colophon has again been written in carbon ink, but this ink is more sparkling than that used for the MS. Evidently this *ślōka* has been written by a different hand than that of the rest of the MS. Therefore, in the following lines we shall not take account of this *ślōka* while considering the handwriting of our poet. This document, excluding the last two lines which contain the *ślōka*, will be referred to below as B.

C, D and E. There is a MS. of the Bālakāṇḍa of the Rāma Carita Mānasa dated 1661 V.E. (1604 A.D.). This is in a temple, named Srāvaṇakuñja, at Ayodhya. Tulasidāsa is not claimed to be the writer of this MS. Only certain corrections made in the MS. are ascribed to him. These corrections are whole-line corrections and occur on three different pages of the MS. Further, these corrections have been noted in the upper or in the lower margin of the pages of the MS.

The claim that these corrections have been made by the poet is put forward by one Sita Prasada. The only ground on which he makes this statement is that the handwriting of these corrections resembles that of the Rajapur MS. of the Ayōdhyākāṇḍa of the Rāma Carita Mānasa. This conclusion is evidently based on two premises: one, that the Rajapur MS. is in the handwriting of the poet; and the other that the writing of the corrections corresponds with that of the Rajapur MS.; none of which seems to be correct.

The MS. is written on white country-made, paper, which has turned somewhat brown on account of being old. The ink used in the MS. as also in the corrections is carbon ink. The MS. is in a good condition. These three disputed specimens of handwriting may be named C, D and E respectively.

F. There is a MS. of the Rāma Gītāvalī, dated 1666 V.E. (1609 A.D.) in the possession of one Chaudhari Chunni Singh of Ramanagar, Benares State. This MS. also, like the above, is

not claimed to have been written by the poet; only a correction on one of its pages is claimed to have been made by the poet. The MS. itself was written by one Bhagavāna Brāhmaṇa, as indicated in its colophon.

The claim that the correction was made by the poet is based on a similarity which the Chaudhury Saheb seems to find between the handwriting of the correction and that of the Deed of Arbitration referred to above. We shall see presently how far these two writings resemble each other.

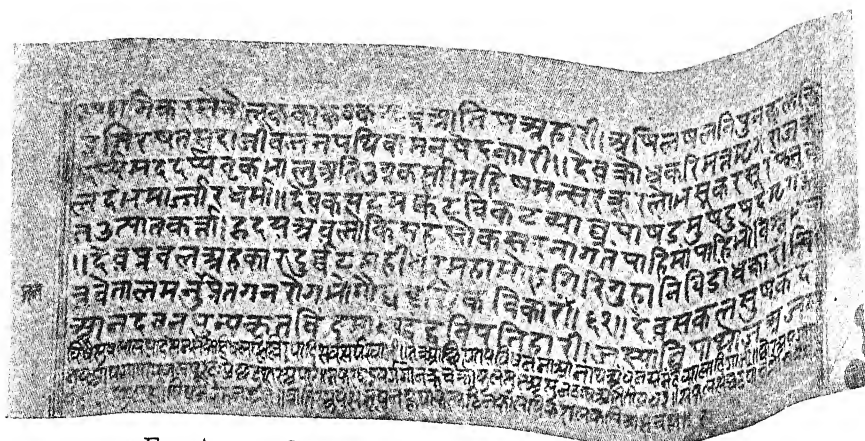
The MS. is written on white-brown paper in carbon ink. It is now in a wornout condition and requires great care to handle it. It appears that in order to remove dust and dirt from its pages, sometimes a piece of coarse cloth was rubbed on them, which erased the ink of the letters. In the discussion that follows we shall refer to this correction as F.

G. There is a MS. of the *Ayōdhyākāṇḍa* of the *Rāma Carita Mānasa* with Munnīlal Upadhya of Rajapur who resides near the temple of Tulasīdāsa. This MS. originally belonged to the temple, but it was removed by the present owner for safety from thieves. There is no colophon in the MS., therefore, neither its date nor its scribe is known. The local tradition at Rajapur, however, ascribes it to the poet. Except for this tradition, there does not seem to be any evidence to support this claim.

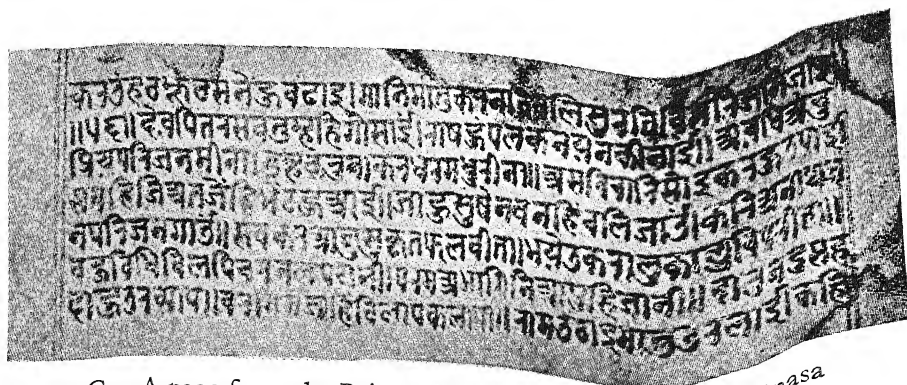
The MS. is on white paper which has turned slightly brown on account of oldness. The ink is carbon ink. The MS. is in a good condition, except for marks of water on the margins of nearly every page. In the discussion that follows it will be referred to as G.

All the photographs in these pages are from the original documents, except that of G which is an enlargement from a photograph of a block printed before.* A photograph of the original in this case was not allowed to be taken by the owners

* Wein International Oriental Congress, 1886, p. 210.



F. A page from the Rāma Gītāvalī MS. (1666 V.E.)



G. A page from the Rajapur MS. of the Rāma Carita Mānasa

A	B	C	D	E	F	G
आ	आ					
गुल्लू	ललसी				ललसी	
3	6				11	
	ललसी				ललसी	
	6				11	
		नप नप नपति				
ललसी	ललसी			ललसी		ललसी
4	4			1		7
ललसी	ललसी					
3	4					
	ललसी		ललसी			
	6					
ललसी	ललसी					
6	4					

A juxtaposed chart of common words in A to G

of the MS., in spite of all attempts for the same.

Let us now analyse these several specimens of handwriting bearing in mind certain well known methods of handwriting identification.

One mode of examining handwritings is by comparing them in respect of their general appearance or 'style', as it is technically called. This consists of the pictorial effect that a writing produces on the mind of the observer. When we examine the specimens A to G from this point of view, we find that B and G seem to be the most regular and uniform of all, followed by A, which is comparatively less regular and uniform than any of the foregoing; C, D and E seem to have a 'style' of their own, less regular and uniform than that of A; and F seems to have a 'style' the least regular and uniform of all.

Another mode of examining handwritings is by comparing the 'movement' or the speed with which the letters and words are written in the different specimens. When we examine the specimens A to G from this point of view, it appears that A is the best, for of all others it displays the greatest freedom of 'movement' and seems to have been written most rapidly. It is closely followed in this respect by F. C, D and E seem to have been written with less freedom of 'movement' and rather slowly, while B and G seem to have been written with considerable care and seem to be the slowest of all. As between B and G also, B appears to be slower than G.

Still another mode of examining handwritings is that by comparing the quality or condition of the strokes and curves in them. Considering these specimens from this point of view, it appears that the condition of the ink-lines in B and G is far superior to that of others. It is quite natural, for they have been written most carefully. The quality of strokes in C, D and E is nearly akin to that in B and G. F follows C, D and E in this respect, while A appears to be the worst.

In judging these specimens by the condition of the strokes it must be remembered that these are all very old writings, and therefore, the ink in the strokes must have been affected by time and also by the conditions under which these were kept. Further, the paper, containing the writing A, was evidently carelessly handled, and consequently torn in several places on the margin and the top. The repairing was, as usual, done by pasting the entire document on another paper. The kind of gum or glue used for the pasting is also not known. It is, therefore, difficult to say how far the condition of ink-strokes in A has been affected by the pasting of the document on the paper to which it adheres today.

A fourth mode of examining handwritings is by comparing the size of letters in them. Now, from this point of view it may at once be noted that B and G are the best. The letters in them are most uniform in size. They are followed by C and D, in which letters are comparatively less uniform than in B and G. A is still less uniform in this respect, and E and F, particularly F, are the least. It may further be noted that the size of letters in A, B and C is somewhat like a square; in D, G, E and F respectively it is more and more rectangular; and in E and F the length of some letters is almost double their breadth.

A fifth mode of examining handwritings is that of noting the space that a writer leaves between each separate letter of his writing. It will be seen that the space between the letters in A is the greatest, but it must be borne in mind that the writing space for A was also the largest. A is followed by C and D. These give less space between letters than A. B and G give even less space, and E and F give the least space between their letters. In E and F, the letters are closer to each other than in any of the other writings.

A sixth mode of examining handwritings is that of noting the manner in which the letters and the words move towards

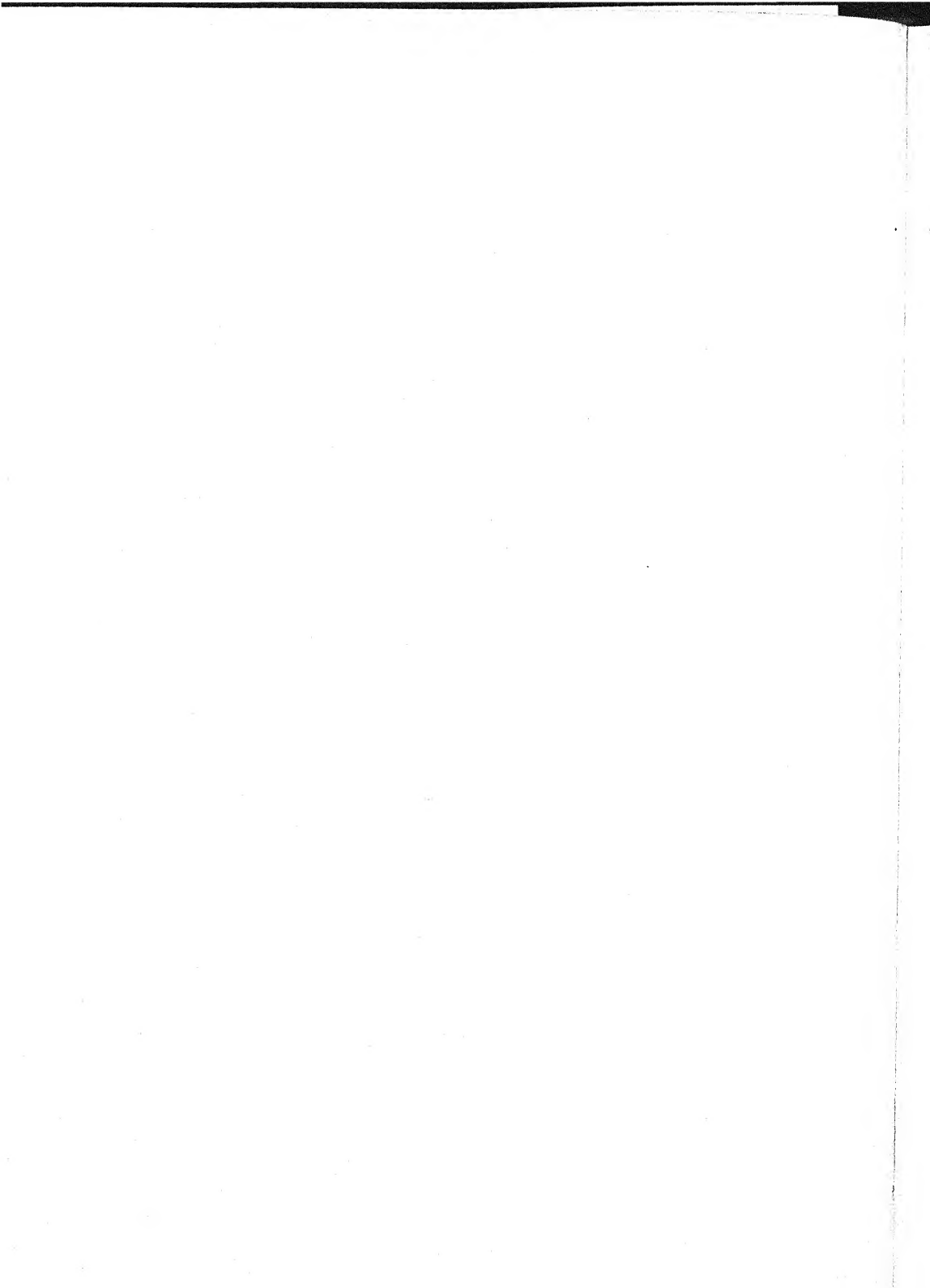
A	B	C	D	E	F	G
अ १					इ १	उ १
आ २	ई २				ऊ २	ऋ २
इ ३	ई ३				ऊ ३	ऋ ३
उ ४	ई ४				ऊ ४	ऋ ४
ए ५	ई ५				ऊ ५	ऋ ५
ओ ६	ई ६				ऊ ६	ऋ ६
अ ७	ई ७				ऊ ७	ऋ ७
आ ८	ई ८				ऊ ८	ऋ ८
इ ९	ई ९				ऊ ९	ऋ ९
उ १०	ई १०				ऊ १०	ऋ १०
ए ११	ई ११				ऊ ११	ऋ ११
ओ १२	ई १२				ऊ १२	ऋ १२
अ १३	ई १३				ऊ १३	ऋ १३
आ १४	ई १४				ऊ १४	ऋ १४
इ १५	ई १५				ऊ १५	ऋ १५
उ १६	ई १६				ऊ १६	ऋ १६
ए १७	ई १७				ऊ १७	ऋ १७
ओ १८	ई १८				ऊ १८	ऋ १८
अ १९	ई १९				ऊ १९	ऋ १९
आ २०	ई २०				ऊ २०	ऋ २०
इ २१	ई २१				ऊ २१	ऋ २१
उ २२	ई २२				ऊ २२	ऋ २२
ए २३	ई २३				ऊ २३	ऋ २३
ओ २४	ई २४				ऊ २४	ऋ २४
अ २५	ई २५				ऊ २५	ऋ २५
आ २६	ई २६				ऊ २६	ऋ २६
इ २७	ई २७				ऊ २७	ऋ २७
उ २८	ई २८				ऊ २८	ऋ २८
ए २९	ई २९				ऊ २९	ऋ २९
ओ ३०	ई ३०				ऊ ३०	ऋ ३०
अ ३१	ई ३१				ऊ ३१	ऋ ३१
आ ३२	ई ३२				ऊ ३२	ऋ ३२
इ ३३	ई ३३				ऊ ३३	ऋ ३३
उ ३४	ई ३४				ऊ ३४	ऋ ३४
ए ३५	ई ३५				ऊ ३५	ऋ ३५
ओ ३६	ई ३६				ऊ ३६	ऋ ३६
अ ३७	ई ३७				ऊ ३७	ऋ ३७
आ ३८	ई ३८				ऊ ३८	ऋ ३८
इ ३९	ई ३९				ऊ ३९	ऋ ३९
उ ४०	ई ४०				ऊ ४०	ऋ ४०
ए ४१	ई ४१				ऊ ४१	ऋ ४१
ओ ४२	ई ४२				ऊ ४२	ऋ ४२
अ ४३	ई ४३				ऊ ४३	ऋ ४३
आ ४४	ई ४४				ऊ ४४	ऋ ४४
इ ४५	ई ४५				ऊ ४५	ऋ ४५
उ ४६	ई ४६				ऊ ४६	ऋ ४६
ए ४७	ई ४७				ऊ ४७	ऋ ४७
ओ ४८	ई ४८				ऊ ४८	ऋ ४८
अ ४९	ई ४९				ऊ ४९	ऋ ४९
आ ५०	ई ५०				ऊ ५०	ऋ ५०
इ ५१	ई ५१				ऊ ५१	ऋ ५१
उ ५२	ई ५२				ऊ ५२	ऋ ५२
ए ५३	ई ५३				ऊ ५३	ऋ ५३
ओ ५४	ई ५४				ऊ ५४	ऋ ५४
अ ५५	ई ५५				ऊ ५५	ऋ ५५
आ ५६	ई ५६				ऊ ५६	ऋ ५६
इ ५७	ई ५७				ऊ ५७	ऋ ५७
उ ५८	ई ५८				ऊ ५८	ऋ ५८
ए ५९	ई ५९				ऊ ५९	ऋ ५९
ओ ६०	ई ६०				ऊ ६०	ऋ ६०
अ ६१	ई ६१				ऊ ६१	ऋ ६१
आ ६२	ई ६२				ऊ ६२	ऋ ६२
इ ६३	ई ६३				ऊ ६३	ऋ ६३
उ ६४	ई ६४				ऊ ६४	ऋ ६४
ए ६५	ई ६५				ऊ ६५	ऋ ६५
ओ ६६	ई ६६				ऊ ६६	ऋ ६६
अ ६७	ई ६७				ऊ ६७	ऋ ६७
आ ६८	ई ६८				ऊ ६८	ऋ ६८
इ ६९	ई ६९				ऊ ६९	ऋ ६९
उ ७०	ई ७०				ऊ ७०	ऋ ७०
ए ७१	ई ७१				ऊ ७१	ऋ ७१
ओ ७२	ई ७२				ऊ ७२	ऋ ७२
अ ७३	ई ७३				ऊ ७३	ऋ ७३
आ ७४	ई ७४				ऊ ७४	ऋ ७४
इ ७५	ई ७५				ऊ ७५	ऋ ७५
उ ७६	ई ७६				ऊ ७६	ऋ ७६
ए ७७	ई ७७				ऊ ७७	ऋ ७७
ओ ७८	ई ७८				ऊ ७८	ऋ ७८
अ ७९	ई ७९				ऊ ७९	ऋ ७९
आ ८०	ई ८०				ऊ ८०	ऋ ८०
इ ८१	ई ८१				ऊ ८१	ऋ ८१
उ ८२	ई ८२				ऊ ८२	ऋ ८२
ए ८३	ई ८३				ऊ ८३	ऋ ८३
ओ ८४	ई ८४				ऊ ८४	ऋ ८४
अ ८५	ई ८५				ऊ ८५	ऋ ८५
आ ८६	ई ८६				ऊ ८६	ऋ ८६
इ ८७	ई ८७				ऊ ८७	ऋ ८७
उ ८८	ई ८८				ऊ ८८	ऋ ८८
ए ८९	ई ८९				ऊ ८९	ऋ ८९
ओ ९०	ई ९०				ऊ ९०	ऋ ९०
अ ९१	ई ९१				ऊ ९१	ऋ ९१
आ ९२	ई ९२				ऊ ९२	ऋ ९२
इ ९३	ई ९३				ऊ ९३	ऋ ९३
उ ९४	ई ९४				ऊ ९४	ऋ ९४
ए ९५	ई ९५				ऊ ९५	ऋ ९५
ओ ९६	ई ९६				ऊ ९६	ऋ ९६
अ ९७	ई ९७				ऊ ९७	ऋ ९७
आ ९८	ई ९८				ऊ ९८	ऋ ९८
इ ९९	ई ९९				ऊ ९९	ऋ ९९
उ १००	ई १००				ऊ १००	ऋ १००

A juxtaposed chart of common letters in A to G (continued)



Lastly, the most popular and the most convincing mode of examining handwritings is that of cutting out common words and letters and placing them side-by-side, that is to say preparing a 'juxtaposed chart.' This device discloses the differences in the formation of letters. Now, when we examine the 'juxtaposed charts' of these specimens, we notice that in respect of formation of letters these vary considerably from each other. This difference is more marked in some than in other letters, e.g. *ja*, *dha*, *na*, *n*, *ba*, *bha*; *ma*, *la*, *va*, *sa*, and *ha* in each of these specimens differ appreciably from those in the others. Similar is the case also with the vowel signs of *i*, *ī*, *u*, and *ō*. Not only these are formed differently in these specimens but also the manner in which these are attached to the letters in the different specimens differs considerably from each other.

Thus, we see that there are no two specimens in all these seven which are identical in every respect. This state of affairs clearly points out that no two of them are in the same hand, much less all the seven of them, and consequently, that if any of these is accepted as genuine, the other six have to be rejected as spurious. It has already been seen that circumstances favour only the first of these viz. the Deed of Arbitration to be in the handwriting of the poet; therefore, though most reluctantly, we have to reject the other six specimens as having no right to the name of the poet, Tulasidāsa.



BANKRUPTCY, IN PRIVATE INTERNATIONAL LAW

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While the major objects of bankruptcy law have been well understood by all states, the national bankruptcy codifications have assumed "a merely municipal character." The difficulties have arisen when the juridical relations of business "have extended themselves over all the world."¹

The purposes of bankruptcy law are mainly threefold :—

- (a) Equitable distribution of assets among the creditors ;
- (b) Protection of the debtor from harassment by his creditors ;
- (c) Prevention of fraudulent conduct of the debtor.²

Under the English law "two conditions must be satisfied before an English Court can exercise bankruptcy jurisdiction over a person ; first, the person must have committed an 'act of bankruptcy' within the meaning of the Bankruptcy Act, 1914 ; and secondly, he must be a "debtor" as defined by the same statute."³

The decision in *Cooke v. Charles A. Vogeler Co.*⁴ ran as follows :—The English Court of Bankruptcy had no jurisdiction to make a receiving order against a foreigner resident abroad, who, without coming into the jurisdiction has had in England a place of business, contracted debts and acquired assets. But

¹ The "Juridical Review," 1895.

² Gibson on "Bankruptcy," X Edition, p. 2.

³ Dr. Cheshire, "Private International Law," pp. 369-370.

⁴ 1901 A. C. 102.

Sec. 1 (2) of the Bankruptcy Act, 1914 has introduced alternative conditions including under the term "debtor," "a person carrying on business in England, personally or by means of an agent or manager," whether a British subject or not. It has to be remembered that further conditions are imposed on a creditor who wishes to start proceedings.¹

Concurrent Bankruptcy

Will the existence of bankruptcy proceedings abroad act as a bar to English jurisdiction? This leads one to an examination of the problem of concurrent bankruptcies. As Dr. Cheshire has well put it: "it is virtually impossible to prevent the initiation of bankruptcy proceedings in various countries, for there is invariably an over-riding territorial rule that proceedings may be taken against a debtor in given circumstances, but the real problem is whether the different administrative bodies should cooperate with each other."²

Such a question fell to be decided in *In re Artola Hermanos*.³ A firm with head offices in Paris and a branch in England—three partners resided in Paris and two in London—was declared bankrupt in Paris and a syndic was appointed. The Court of Appeal refused to stay the English bankruptcy proceedings on the application of the syndic. Since there were assets within the jurisdiction, it was held that a receiving order was properly made and that the fact that a prior bankruptcy had been commenced in a foreign country not shown to be the country of the domicile of the debtors was no ground for staying the proceedings in England.

Fry, L. J. enunciated three possible views in the above case :—

(i) When there are concurrent bankruptcies, each

¹ §4 (1) *d*, Bankruptcy Act, 1914.

² Dr. Cheshire, "*Private International Law*," p. 373.

³ 1890, 24 Q. B. D. 640.

forum is to administer the assets locally situated within its jurisdiction, each forum, of course allowing all the creditors to prove, but allowing the doctrine of hotchpot, so as to produce so far as may be, equality.

- (ii) "Every other forum shall yield to the forum of the domicile, and that the forum of every other country shall act only as accessory to and in aid of the forum of the domicile." Though this course has high authority to support it, as Dr. Cheshire put it, English Courts have not stayed proceedings on this ground alone.
- (iii) Giving priority to the forum in which bankruptcy proceedings were first commenced irrespective of domicile provided that there were assets within the jurisdiction—Fry, L. J. calls this course "an entirely unreasonable one."

It is worthy of note to refer at this stage to the decision in *In re a Debtor*.¹ When a bankruptcy notice had been issued and served upon the debtor requiring payment of a judgment-debt and the debtor, before the expiration of the time fixed for compliance with the notice, obtained upon his own petition an order of sequestration in Scotland, whereby all his assets became vested in the Scottish trustees, it was held by the Court of Appeal that the English Courts had jurisdiction to make a receiving order notwithstanding the sequestration; and there being assets and creditors in England, such an order was properly made.

Effect of Foreign Bankruptcy

The laws of Scotland, Northern Ireland and the Irish Free State "somewhat differ" from the English law regarding the

¹ 1922, 2 Ch. 470.

Vide also 1929, 1 Ch. 362.

title of a trustee appointed in any of these countries. An assignment by a foreign bankruptcy passes all movable property situate in England, including choses in action.¹

The distribution of assets under a bankruptcy is entirely a matter for the *Lex Fori*, under the authority of which the bankrupt has been adjudicated and distribution ordered. Where the estate of the same debtor is being administered both in England and abroad, a creditor who has received a dividend under the foreign bankruptcy will not be allowed to prove in England without bringing in what he has received (*Banco de Portugal v. Waddell*, 1880. 5 A.C. 161).

The trend of modern decisions is that the "foreign trustee need not derive his title from the *lex domicilii*" of the debtor. A Queensland insolvency was recognized in England, the debtor having presented his own petition and being resident there.² But in *In re Hayward*,³ it was held that the trustee in a New Zealand bankruptcy had no title in England as the debtor was domiciled in England. However, in *In re Anderson*⁴, where the debtor had submitted to the jurisdiction though he had not presented his own petition, Phillimore, J. held on an exhaustive review of the authorities that the *Blithman*⁵ and *Hayward* cases were not clear authorities for domicile, and that even if they were, he was not prepared to follow them in the face of *Davidson's* case, and that a colonial adjudication valid by the colonial law was entitled to recognise in England even though the debtor was domiciled in England. He also suggested that different considerations might arise if the debtor had been no party to the adjudication or if it had been made in his absence.

The facts of the leading case in *In re Davidson's Trusts*,

¹ *Solomons v. Ross*, 1764. 1. H. Bl. 131(N).

Jollet v. Depontthieu, 1769. 1. H. Bl. 132(N).

² *In re Davidson's Settlement Trusts*, 1873, L. R. 15 Eq. 383.

³ 1897. 1. Ch. 905.

⁴ 1911. 1. K. B. 896; Vide also *In re Craig*, 1916, 86. L. J. Ch. 62.

⁵ 1856. L. R. 2. Eq. 23.

deserve this examination. W.....who had settled in Australia and had, upon his own petition, been adjudicated an insolvent and received his certificate there, afterwards visited England and died there intestate, leaving a widow in Australia and creditors who had received only a small dividend on their debts. Under a settlement made on the marriage of the father and mother of W, the father who died in 1869, had power to appoint a fund amongst his children, who in default of appointment were entitled equally. The power was not exercised. W's share of the fund had been paid into Court. On a petition by the Official Assignee in insolvency, it was held that he was entitled to the fund in Court. As James, L. J. put it: "it would be impossible to carry on business in the world if the Courts of every country refused to act upon what had been done by other Courts of competent jurisdiction."

It has to be noted that this "principle of universality" does not apply to immovables in England. As Dr. Cheshire has it, there is possibility of exercise of discretion by the English Court permitting a foreign trustee to sell "land situate in England for the benefit of the bankrupt owner's creditors."

An intriguing problem arises in the question, can a creditor who has obtained payment abroad, be made to "disgorge what he has recovered" while he does not seek to take part in the English bankruptcy? A great service to clear thinking has been done by Dr. Cheshire. The cases decided in 1791 and 1795, are not productive of laying down the unerring principle.¹ The stress by Piggott on the nationality of the creditor and the emphasis by Westlake on domicile are both open to criticisms on grounds of inadequacy and cumbrousness. Professor Dicey wanted to solve it on the grounds of knowledge of existence of the English bankruptcy on the part of the creditor and on the test whether

¹ *Sill v. Worswick*, 1791, 1. H. Bl. 665.

Hunter v. Potts, 1791, 4. T. R. 182.

Phillips v. Hunter, 1795, 2. H. Bl. 402.

the foreign law recognizes the title of the English trustee.¹ The tests laid down by Professor Dicey have practical value *pace* the criticisms of Dr. Cheshire. Dr. Cheshire lays down the simple solution in the query: "Is the creditor subject to the English bankruptcy law?" But the difficulty of defining what is meant by subjection to English bankruptcy jurisdiction, still persists. The conditions laid down in S. 4 (1) *d* of the Bankruptcy Act, 1914 regarding the 'debtor' would have to be applied to the creditor. By its very nature, this is a complex question where alternative positions put forward by Professor Dicey are bound to prove of greater value than any brilliant effort at simplification.

Effect of Discharge

In bankruptcy the effect of a discharge is to free the debtor "from liabilities incurred prior to the order of discharge." The general principle is that a discharge valid by *the proper law* is valid everywhere.² As Bovill, C. J. laid down :—"A liability arising in any country may be discharged by the laws of that country."³

So far as bankruptcies in England, Ireland, or Scotland are concerned, an order of discharge is made applicable throughout the Dominions by statute.

The broad principle is that discharge rests upon the *forum* of the obligation. That advertence is to the proper law governing the debt and not necessarily to the *lex domicilii* has been decided in *Gibbs and Son. v. Societe Industrielle*.⁴

The sphere of bankruptcy in Private International Law has had the intriguing disadvantage of diversity of decisions arising out of the application of differing national laws. This realm

¹ Dicey, *Conflict of Laws*, V Edition, pp. 372-3.

² *Gardiner v. Houghton*, 1862. 2. B. & S. 743.

³ *Ellis v. McHenry*, 1871. L. R. 6. C. P. 228.

⁴ 1890. 25. Q. B. D. 399.

is bound to have a vital interest *in presenti* as business relations spread throughout the world under complex forms. After the Bankruptcy Act of 1914 in England, a foreign merchant carrying on business through agency in England cannot escape jurisdiction by the accident of not being present in England. At no other branch of law is it so much necessary as in bankruptcy for nations to evolve uniform laws through international conventions.

References

1. Dicey : *Conflict of Laws*, V Edition, 1932.
2. Beale : *Conflict of Laws*, II Ed.
3. Story : *Commentaries on Conflict of Laws*, VIII Ed.
4. Westlake : *Private International Law*, VII Ed.
5. Wharton : *Treatise on Conflict of Laws*, III Ed.
6. Hibbert : *Private International Law*.
7. Dr. Cheshire : *Private International Law*, 1935.
8. Foote : *Private International Law*, V Edition.
9. Phillimore : *Commentaries*, Vol. IV, 1861.
10. Piggott : *Foreign Judgments and Parties out of the Jurisdiction*, III Ed.

SCIENCE

SECTION I CHEMISTRY



CHEMICAL EXAMINATION OF SOME OF THE INDIAN MEDICINAL PLANTS

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*(Being a thesis submitted to the University of Allahabad for
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CHAPTER I

Introduction

Medicine has been practised in some form or the other from days of antiquity since life and disease have co-existed, and drugs have been used for the alleviation of human suffering from the remote past. Especially in India plants have been used as drugs from 2500 B.C. Ayurveda, the materia medica of the Hindus, which is in fact the very basis of the ancient Indian medical science, deals with different aspects of the science of life and the art of healing. It also gives definite properties of drugs, of vegetable, animal and mineral origins, and describes their uses. Later on world renowned Indian savants of the type of Charak, Susruta, Narahari Pundit, Madana Pal, Bhava Misra etc. have devoted their valuable talents and untiring energy towards the evolution of a system of curative medicine from these indigenous medicinal plants and other products of India. As a result of their cumulative efforts, "the famous Ayurvedic system of Indian medicine has been evolved which from the point of view of curative properties is hardly equalled and far less excelled by any other system of medicine."

India is a vast country and lies practically completely

within the tropical region. It has got a heavy rainfall throughout the greater part of the year. The climate throughout the length and breadth of the country varies considerably. These facts together with such wonderful nursery as the Himalayas made India renowned as a leading centre of very rich medicinal herbs. Drugs requiring hot, tropical and damp climate, to those requiring cold, dry and temperate one can be cultivated in some part or other of India. In fact "it can be said without exaggeration that India could supply the whole of the civilised world with medicinal herbs. Leaving aside those drugs which are used in the indigenous system whose therapeutic value is uncertain, most drugs of reputed therapeutic values used by the pharmacopoeias of different nations grow in a state of nature in some part or other of the country".

The Indian system of medicine, with a *materia medica* consisting of such potent drugs as India could produce, has been regarded by many of the Western scholars as something unscientific. Exponents of the Western system of medicine say that Ayurvedic system is based on lines which are not quite experimental and is merely a system of induction and deduction with a little guess work and the experiences of our forefathers. This statement is untrue. "A system which has survived to such an extent withstanding the test of centuries and has been in fact the father of all other systems of the world, can never be brushed aside as something unscientific."

However the fact remains that medicine as a science has progressed considerably in modern times. The pharmacology and therapeutics of every drug used in Western pharmacopoeias have been carefully studied and it is after this that they are prescribed. Unfortunately the Indian system of medicine stands at present where it was two thousand years ago. Very few attempts have been made to advance the knowledge by scientific research and to bring the system in line with the modern scientific progress of the world. Apart from finan-

cial considerations which is most important these drugs are more suited to the vast millions of India, partly due to their habits and partly due to climatic conditions. It is for these reasons that a revival of the indigenous system under changed scientific circumstances, is of utmost importance both for the scientific world at large and to the population of this vast country ninety per cent of which has to depend on these crude bazaar drugs, they having no access to the refined western scientific medicines.

It is indeed our misfortune that the chemistry and pharmacology of most of the Indian medicinal plants have not been properly investigated. There is no doubt that investigation and research into these "old women's remedies" might bestow to the scientific world many valuable and useful weapons for the alleviation of human sufferings. For it is admitted on all hands that "the Indian system of medicine is a very rich mine of knowledge from which many useful things might possibly be unearthed". After recording the medicinal uses we have to weed out the worthless from the good amongst these medicinal plants, for there are many that are devoid of the activity they are alleged to possess. For this a systematic chemical examination is very essential. It is well known that plants generally owe their virtues as medicinal agents to certain characteristic alkaloids or other active principles present in them. It is mainly due to the fact that a complete and full chemical analysis of the medicinal plants has not been undertaken that there exists so much uncertainty regarding their therapeutic and pharmacological actions. The isolation of the active principles present in the plant, will certainly constitute a great step towards the improvement of the Indian medical system.

The systematic chemical examination of all the well known Indian medicinal plants is a colossal task which requires an organisation on a huge scale in order to arrive at a workable generalisation. It is probably the work of a century or more by a whole

nation. But in spite of the colossal magnitude of the problem before us, it can be easily seen from what has been said above, that any small contribution by individual workers is very likely to advance the cause of knowledge a step further and to bring it nearer to the goal of a complete co-ordination between ancient and modern sciences.

In the present thesis six plants which are reputed to possess great physiological properties in the Ayurvedic system of medicine, viz. *Beerhaavia diffusa* roots of *Citrullus colocynthis*, *Cuscuta reflexa*. *Lagenaris vulgaris*, bark of *Terminatia arjuna* and fruits of *Trapa bispinosa* have been examined chemically and the various constituents separated, purified and analysed.

CHAPTER II

The Chemical Examination of Plants

Although in literature there are more than two hundred natural orders of plants in which medicinally active principles are believed to exist and which are actually mentioned by the Indian writers, but systematic examination has revealed that most of the potent active principles are found in a comparatively small range of natural orders of plants. For example the following are amongst the most important of the natural orders which contain potent medicinal principles:—*Acanthaceae*, *Apocynaceae*, *Anacardiaceae*, *Compositae*, *Cucurbitaceae*, *Convulvulaceae*, *Eupharbiaceae*, *Leguminosae*, *Papaveraceae*, *Renunculaceae*, *Rubiaceae*, *Rutaceae*, *Solanaceae*, *Umbelliferae*, *Zygpphyileae* etc. etc. The above are the natural orders in which fall drugs containing such powerful alkaloids as morphine, quinine, atropine, etc., such strongly active glucosides as strophanthin, digitoxin, digitalin etc., and such valued lactones like santonin etc. They also contain a variety of other products some of which are physiologically active and others physiologically inactive. How-

ever other natural orders also contain plants which on chemical analysis, have furnished products of great chemical and physiological interest. At present it is very difficult to say which natural order is very rich in active principles and which comparatively poor.

Investigations on the chemical examination of Indian medicinal plants can be briefly summarised as being the isolation, purification and characterisation of the following products which are generally met with in researches of these type :

Alkaloids : Many of the Indian medicinal plants contain highly active and potent alkaloids the isolation of which at times is met with considerable difficulty. Generally they can be isolated from the plants either by concentrating the alcoholic extract after the removal of tannins and other products e.g. the isolation of caffeine from tea dust the isolation of fumarine from *Fumaria officinalis* (Agarwal, unpublished work) etc. etc.; or more generally by treating the concentrated alcoholic extract with 2% acidulated water, neutralising the aqueous extract with ammonia and extracting it with either chloroform or ether e. g. the isolation of punarnavine from *Boerhaavia diffusa* Linn (Agarwal and Dutt, Proc. U. P. Acad. Sci., 1935, 5, 240) etc. etc. Advantage is at times taken of the solubility of either of the free base or one of its salts, in one of the solvents in order to separate them from mixtures. In this way pseudo-aconitine has been isolated from *Aconitum de-incorrigum*; indaconitine from *Aconitum napellus*; bikhaconitine from *A. spicatum* and *A. lacinitum*; ephedrine from *Ephedra vulgaris*; hyoscyamine, atropine and hyoscine from *Datura stramonium*; vasicine from *Adhatoda vasica* (Sen and Ghosh, Jour. Ind. Chem. Soc., 1925, 1, 315) ricinine from *Ricinus communis*; Kurchine, Kurchicine, Conessine, Conessimine, Holarrhimine and Holarrhine from *Holarrhena antidysenterica* (Ghosh and Bose, Arch. Pharm, 1932, 270, 100; Siddiqui and Pillay, Jour. Ind. Chem. Soc., 1932, 8, 553) Ajmaline, Ajmalinine, ajmalicine, serpentine and serpentinine

from *Raufolesia serpentina*. Carpine and Carpeinine from *solanu*, *Xantho-carpum*, Moringine from *Moringa Pteryga Psperma*, chaksine and iso-chaksine from *Absus chaksu*.

It is gratifying to note that there are still a large number of Indian medicinal plants which are very successfully used in various ailments, and which on qualitative examination reveal the presence of alkaloids, but all attempts to isolate them in a pure form have been baffled up to this time. Examples of this type are : *Tinospora cordifolia*, *Tribulus terrestris*, *Melia azadirachta*, *Saraca india*, *Carrisa carandas alrugium lamarchii* etc., etc. It is possible that with the increase of knowledge about these vegetable bases, methods may be discovered which may succeed in isolating them in a pure form, in spite of their microscopic presence in the materials.

Glucosides : Next to alkaloids the substances which exert physiological action are probably the glucosides which are also found to exist widely in Indian medicinal plants. They can be isolated either by concentrating the alcoholic extract of the plant, or by extracting the concentrated alcoholic extract by a suitable solvent, or by precipitating them in the form of lead salt and decomposing the lead salt so formed by hydrogen-sulphide. By either of these methods the glucosides are obtained in the form of colourless crystalline substances, which on hydrolysis by mineral acids give a sugar and a aglucose. They are generally bitter in taste and possess high physiological activity. Examples of such potent glucosides are : digitoxin, digitalin, and digitonin from Indian fox-glove (*Digitalis purpurea*); strophanthin from *strophanthus*; thevetin and thevetoxin from *Thevetia nerifolia* (Ghatak, Bull. Acad. Sc. U.P., 1932, 2, 79), Chiratin from *Swertia chirata* (Majumdar and Guha, J. Ind. Inst. Sc., 1933, 16 A, 34). Blepharin from *Blepharis edulis* (Lal, Jour. Ind. Chem. Soc., 1936, 13, 109); glycosmin from *Glycosmis pentaphylla* (Dutt, Proc. U. P. Acad. Sc., 1935, 5, 55); bonducin from *Caesalpinia bonducella* (Ghatak, Proc. U. P. Acad. Sciences, 1934, 4, 141) and so on.

Pharmacological examination of many of the above glucosides, has clearly indicated that they possess in high degree the properties attributed to the plants.

Colouring matters : Next in order of importance are probably the colouring matters present in plants. Although they are responsible for the various shades of colour which the plant exhibits, but it has been found that many of them possess to a considerable extent physiological and pharmacological values and as such are responsible for the action of many drugs used in the Indian system of medicine. They can be isolated from the plants either by concentrating the alcoholic extract whereby they are separated as crystalline bodies, or more generally by separating them in the form of their lead salts and subsequent decomposition by hydrogen sulphide. For particular class of colouring matters e.g. anthocyanins etc. special methods have to be adopted (Richard Willstätter, Ann. Chem. Leibig, 1915, 8, 15, *ibid.* 1916, 412, 195). Examples of such colouring matters are very wide and mention will be made only of a few worked out in these laboratories. Thus rottlerin was isolated from *Mallotus philippinesis* (J. C. S., 1925, 127, 2044). Lawsone from *Lawsonia alba* (Lal and Dutt, J.I.C.S., 1933, 10, 577); Nycanthin from *Nyctanthes arborescens* (Lal, Proc. Nat. Ins. Sc. India, 1936, 2, 57); Plumbagin from *Plumbago zeylanica* (Roy and Dutt, Jour. Ind. Chem. Soc., 1928, 5, 419); embalin from *Embelia ribes* (Roy, Kaul and Dutt, J. Ind. Chem. Soc. 1929, 5, 577); butrin from *Butea frondosa* (Lal and Dutt, J. Ind. Chem. Soc., 1935, 12, 262) and amarbelin and Cuscutin from *Cuscuta reflexa* (Agarwal, Jour. Ind. Chem. Soc., 1936, 13, 561; Agarwal and Dutt, Jour. Ind. Chem. Soc., 1935, 12, 384).

Lactones : In between the glucosides and the colouring matters, another class of compounds may be introduced which for want of a suitable name are termed as lactones since they contain at least one lactone ring in their structure. These type of substances are also very widely distributed in vegetable king-

dom and evidence is at present wanting (with the exception of a few) to show, whether they possess any physiological activity or not. They may be also what are called "bitter principles", but generally they are non-bitter, colourless or pale yellow crystalline substances giving a set of definite reactions. They may be isolated from the alcoholic extract either by concentrating it whereby they crystallise out or by choosing a suitable solvent and dissolving them in it from the alcoholic extract. Examples of these are : Santonin from *Artimesia maritima*; aloin from *aloe vera*; Corchoritin from Jute seeds (Sen, J. Ind. Chem. Soc., 1931, 8, 651); marmelosin from *Aegle marmelos* (Dikshit and Dutt, J. Ind. Chem. Soc., 1930, 1, 759); Psoralin from Soc. 1933, 10, 41; Toddalolactone from *Toddalia aculeata* (Dey and Pillay, Arch. Pharm., 1933, 271, 477), elaterin from *Citrullus Colocynthis* (Agarwal and Dutt, Proc. U. P. Acad. Sc., 1935, 3, 250), Cuscutalin from *Cuscuta reflexa* (Agarwal and Dutt, J. Ind. Chem. Soc., 1935, 12, 384, 585); Arjunetin from *Terminalia arjuna* (Agarwal, unpublished work) and Cleomin from *cleome viscosa* (Misra and Dutt, unpublished work). It is very interesting to note that many plants, which are reputed to have anthelmintic properties contain substances of this type.

Essential oils : Next to alkaloids and glucosides the principle responsible for the great physiological activity of many aromatic Indian medicinal plants are the essential oils which are met with in a large number of drugs. Thus *Mentha sylvestris* contain menthol; anise oil contain anethol; *Carum copticum* (ajowan oil) contains thymol; camphor oil contains borneol and camphor; Sandal wood oil contains santalol and so on. It has been found that the active principle of *Psorales corylifolia* is an essential oil (Chopra, R. N. and Chatterji, N. R., 1927, Ind. Jour. Med. Res., 15, 49). Essential oils can be very easily isolated from the drugs by steam distillation, whereby they come along with the condensed water and may be extracted by means of ether.

Vegetable oils : Many Indian medicinal plants contain vegetable oils of special and unusual constitution and due to this are of great chemical and physiological interest. They are responsible for the laxative and purgative properties of many drugs used in the Indian system. At times they also contribute to the cooling effects produced on external applications. They can be easily extracted from the seeds, in which they are generally present, by percolating, with petroleum ether or benzene and distilling back the solvent. The purgative principle of castor oil are undoubtedly the glycerides of ricinolic acids: of carotol oil the α -crotonic acid; of arachis oil the arachidic acid etc. etc. The laxative and stimulating effect of linseed oil is due to linolenic acid, of sativa oil due to sativic acid (tetrahydrosy-stearic acid); of chaulmoogra oil due to chaulmoogric and hydnocarpic acids (Power and Gornall, J.C.S., 1904, 838, 851; Power and Barrow Cliff, J.C.S., 1905, 884, 806); of cocoanut oil due to lauric acid and of almond and walnut oil due to unsaturated acids. The unsaponifiable matter present in these oils consisting mostly of sterols is at times a source of great physiological activity. The sterols are also present, apart from oils, in plants themselves e. g. *Hygrophylla spinosa* (Ghatak and Dutt, Jour. Ind. Chem. Soc., 1931, 8, 23), *Salanum xanthocarpum* (Zaidi and Kanga, Proc. Ind. Acad. Sc., 1936, 3, 341). Thus it has been observed that the active principle of Bonducella oil is ipuranol, the active principle of chilghozeh oil is sitosterol and so on. These sterols which may also be present as glucosides, in combination with sugars, although present in very small quantities (1.5-2%) yet they have been found so greatly to affect the physiological characters of the oil that the latter or the plant itself becomes of sufficient medicinal interest.

Resins and other amorphous complex bodies: After the important class of substances described above a plant chemist always meets with substances of the nature of resins and other amorphous complex bodies, which though chemically impure yet

contribute to a large extent, to the great physiological activity of Indian medicinal plants. Amongst them mention may be made of resins of various descriptions, which are amorphous, aromatic and brittle masses and which are responsible for the physiological activity of many drugs e.g. *Balsamodendron mukul* etc; lecithins; tennins and phlobaphenes; sugars and allied substances; pectins; mucilages which are at times very important in cases of intestinal trouble e.g. *Plantago ovata*. *Aegle mallelos* etc.; starches (rare starches like inulin also), proteins which in the case of *Abrus precatorius* are responsible to the poisonous character of the drug etc., etc.

Enzymes : Another class of complex organic bodies, capable of exerting catalytic action, has been isolated from the vegetable kingdom and to them the name of enzymes has been given. A plant may contain a number of enzymes and the purification of the latter is always a matter of great difficulty. The following enzymes may be present in plants:—invertase, diastase, maltase, inulase, emulsin, esterase, lipase, protease, urease, catalase, oxidase, peroxidase, pepsin, papain, erepsin, tyrosinase etc. These are also responsible for some of the important pharmacological properties possessed by many Indian medicinal plants. Thus it has been found that the active principle of the fruit of *Carica papaya* is an enzyme 'papain' which acts as a digestive principle; of *cephalandra indica* an enzyme 'glucokenin' which has the property of reducing blood sugar; of *Gymnena sylvestra* an enzyme which oxidises glucose in solution and so on.

Other Products : Apart from these substances which are supposed to be responsible for the physiological action of many drugs, chemical examination at times reveals the presence of other substances in plants, which may not be of any importance from the viewpoint of pharmacology, yet are of sufficient chemical interest. Thus hydrocarbons, alcohols, bodies of phenolic nature, organic acids, inorganic salts etc., are some

of the few substances which at times come out in the course of a systematic chemical analysis of plants.

(a) *Hydrocarbons*: These are organic substances containing carbon and hydrogen only and do not give many reactions. Thus thevetene was isolated from *Thevetia nerifolia* (Ghatak and Pendse, Bull. Acad. Sc. U. P., 1932, 2, 79); Hentriacontane from the roots of *Citrullus Colocynthis* (Agarwal and Dutt, Proc. Acad. Sc. U. P., 1935, 4, 295); fumarene from *Fumaria officinalis* (Agarwal, unpublished work) etc., etc.

(b) *Organic acids*: Simple organic acids are very widely known to exist in vegetable kingdom, but complex bodies giving reactions for acids are also not infrequent. Thus Boerhaavie acid has been found to exist in *Boerhaavia diffusa* (Agarwal and Dutt, Proc. Acad. Sc. U. P., 1934, 4, 73); Arjunin in the bark of *Terminalia arjuna* (Agarwal and Dutt, Proc. Acad. Sc. U. P., 1935, 5, 50) etc., etc.

(c) *Bodies of phenolic nature*: These are also very widely distributed in nature. They generally give colour with ferric chloride and form benzoyl derivatives. Thus arjunin has been isolated from *Terminalia arjuna* (Agarwal and Dutt, Loc. cit.) which was shown to be a di-hydroxy phenolic substance; semicarpol (mono-hydroxy phenol) and bhilawanol (o-dihydroxy phenol) from *Semicarous nocardium* (Pillay and Siddiqui, Jour. Ind. Che. Soc., 1931, 8, 517).

(d) *Inorganic substances*: Not infrequently does a chemical examination reveal the presence of pure salts of inorganic nature existing as such in plants. They generally crystallise out on cooling the dilute alcoholic extract of the drug. They have been generally found to be salts of potassium either the chloride or the nitrate or a mixture of the two. It has been proved beyond doubt that the diuretic properties of many drugs are mainly due to the presence of these salts of potassium. Thus potassium nitrate was isolated from *Boerhaavia diffusa* (Agarwal and Dutt, loc. cit.) and from *Solanum Zantho-carpum* (Pendse

and Dutt, Ind. Jour. Med. Res., 1932, 20, 266); Potassium chloride from *Tribulus terrestris* (Ghatak, Bull Acad. Sc. U. P., 1933, 2, 162); a mixture of potassium chloride and nitrate from *Fumaria officinalis* (Agarwal, unpublished work) etc., etc.

CHAPTER III

Boerhaavia diffusa, Linn

Boerhaavia diffusa Linn called 'punarnava' in Sanskrit and Bengali, 'Sant, thikri or Ghadhava purna' in Hindustani is a plant belonging to the natural order Nyctaginaceae. The plant grows all over India as a common creeping troublesome weed and is especially abundant during the rains. The roots are stout and fusiform and have a bitter and nauseous taste. The stem is often viscid and glabrous; the leaves are thick and arranged unequally, green and glabrous above and often white underneath. The flowers are small and sessile 4 to 10 together in a small bracteolate umbel forming slender, long stalked axillary and terminal petals. The fruit is oblong, dull green or brownish and about the size of a caraway bean. The Ayurvedic authorities recognise two varieties of the plant the one with white flowers called "Sweth purna" and the other with red flowers called "rakt purna".

Boerhaavia diffusa has been in use in the indigenous medicine from a very long time. It is described as possessing laxative and diaphoretic properties. Further it is supposed to be beneficial in oedema, anaemia, heart diseases, cough and intestinal colic. Susruta mentions its use in snake poisoning and rat-bite infection. The Tibbi physicians lay stress on its use in asthma, jaundice and ascites and mention its use as a diuretic. U. C. Dutt writes: "It is successfully used in jaundice, ascites, anascara, scanty urine, internal inflammations and as a diuretic in gonorrhoea." If taken in sufficient doses it acts as a powerful

emetic. The French and the Portuguese have used it in all the above-mentioned troubles with a marked degree of success. ¹⁻²

The chemical work on the plant till the author³ undertook it was very meagre. Ghoshal⁴ in 1910 analysed the drug and showed that it contained a sulphate of a body alkaloidal in nature, an oily amorphous mass of the nature of a fat and sulphates and chlorides and traces of nitrates and chlorates from the ash. In 1924, Chopra, Ghosh, and De, analysed the plant and found that it contained a large amount of potassium nitrate and an alkaloid (.01%) called punarnavine. The alkaloid according to them had a bitter taste and the hydro-chloride was obtained in a crystalline form. They used the aqueous solution of the hydro-chloride for all their pharmacological work.

As a result of the present investigation the following substances have been isolated from the dried drug :

1. Boerhaavic acid $C^{10} H^{18} O^3$ m.p. $108-109^{\circ} C.$ (.05%)
2. Punarnavine m.p. $235^{\circ} C.$ (.01%)
3. Potassium nitrate (1.0%)
4. Tannins and phlobaphenes (1.2%)

Analysis of the ash showed that it contained potassium magnesium, sodium, calcium, nitrate, phosphates, silica and sulphates.

Boerhaavic acid was obtained along with some potassium nitrate on concentrating the hot alcoholic extract. It crystallises out from a mixture of acetone and alcohol in micro-crystalline flakes melting at $108-109^{\circ} C.$ and gave a darkish green precipitate with neutral ferric chloride and a white precipitate with alcoholic lead acetate. It dissolved in alkalis and burned with a non smoky flame. It did not give any acetyl derivative nor could it form any oxime. It gave a lead salt and a di-bromobromid.

Punarnavine was isolated from the concentrated alcoholic extract by macerating it with acidulated water and making the

aqueous extract slightly alkaline with ammonia and shaking repeatedly with chloroform. The free base was obtained in the chloroform extracts and was further purified. It is a white crystalline substance crystallising in rectangular plates from ethyl alcohol. It shrinks at 187° and melts with decomposition at 235° C. It has got a bitter taste, and gives a green colour with alcoholic ferric chloride. The hydro-chloride was obtained as white crystalline tufts melting at 135° C. Since the yield was very small nothing more could be done.

Pharmacological action: The pharmacological action of the alkaloid was studied by Chopra and others⁵. Intravenous injections of the alkaloid in cats produce a distinct and persistent rise of blood pressure and a marked diuresis, the diuresis being mainly due to the action of the alkaloid on the renal epithelium although the rise in blood pressure may contribute towards it. Clinically the liquid extract made from the plant produces diuresis in cases of oedema and ascites. When the liquid extract is used the presence of large amount of potassium salts no doubt reinforce the action of the alkaloid.

CHAPTER IV

Roots of Citrullus Colocynthis, Schrader

Citrullus Colocynthis called Colocynth in English; 'Indravaruni' or 'Vishala' in Sanskrit; 'Hanzal' in Persian; 'Indrayan' in Hindi and Bengali is a plant of the natural order *Curcubitaceae*. It is widely distributed in India. It is grown wild in waste tracts of North West, Central and South India and in Baluchistan. The fruit is globular of the size of an orange when ripe and the root is fibrous, tough, stingy of an yellowish white colour. All parts of the plant are very bitter.

Colocynth is a very old remedy in Indian medicine. The fruit has been described as cathartic and useful in biliousness,

constipation, fever and intestinal parasites. The root is described by the Sanskrit writers as a useful cathartic in jaundice, ascites, urinary diseases and rheumatism. Mohammedan physicians use this drug as a drastic purgative removing phlegm from all parts of the system. The roots along with fruits are commonly used in India whereas only the pulp is official in the British Pharmacopoeia. It enters in the form of solid extract in many of the purgative pills of modern pharmacy.

Various workers examined the fruit of this drug chemically, but Power and Moore¹ in 1910, in the course of their elaborate investigations on the constituents of the pulp from the fruits of colocynth, stated that it contained a dihydroxy alcohol citrullol, an amorphous alkaloid, λ - α -elaterin, hentriacontane and a phytosterol. However the roots remained practically untouched till the author undertook its investigation.

As a result of this work the roots have been shown to contain the following substances:

1. α -elaterin— $C_{28}H_{38}O_7$ m.p. 229-230° C. (0.2%)
2. An amorphous saponin (1.2%)
3. Hentriacontane— $C_{31}H_{64}$ m.p. 66-67° C.
4. In organic materials and reducing sugars

α -elaterin $C_{28}H_{38}O_7$ was first of all isolated from *Ecballum elaterium* juice sediment. It is obtained crystalline from ethyl alcohol melting at 229-230°. It gave a di-acetyl derivative $C_{32}H_{42}O_9$ m.p. 122-123° C. and showed the presence of at least one lactone ring since it gave a reddish colour with alcoholic potash and reduced Tollen's reagent readily. Barg⁴ showed that elaterin gives acetic acid on being heated with alcoholic potash. This confirms the presence of one acetyl group in the molecule. On the basis of these considerations the following configuration for elaterin has been proposed :

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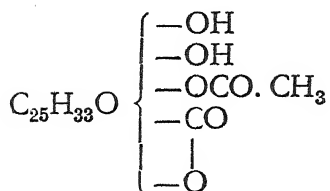
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Out of the seven oxygen atoms six have been accounted for. The remaining oxygen atom is not present either as a carbonyl group or as a methoxyl or ethoxyl group. It may be present as an ether linking in the molecule. Moore⁵ in 1910, showed that on distillation with zinc dust α -elaterin gives a derivative of naphthaline. α -elaterin therefore must contain a naphthaline nucleus in its structure.

CHAPTER V

Cuscuta reflexa—Roxb stems and the seeds

Cuscuta reflexa Roxb, known as 'Amarvel' or 'Akasoel' in Hindusthani and 'Swarnalata' in Bengali is a very common golden yellow dodder like parasite belonging to the natural order *convolvulaceae*. It is common throughout India growing on thorny or other shrubs. The seeds of this plant which are known as 'Khasus' in vernacular are four in number attached to the end of the stem, light brown in colour, convex on one side, concave on the other and enclosed in a nearly globular capsule about the size of a radish seed. The taste of the seed is somewhat bitter.

As regards the medicinal properties Mohammadan writers consider it to be alterative and depurative, a purge for bile and black bile, useful in affections of the brain such as fits, melancholy, insanity etc. It is also supposed to be purgative and used externally against itch and internally in protracted fever, retention of wind and induration of the liver. The seeds are supposed to be carminative and anodyne. A cold infusion of the

seeds is given as depurative. In the Punjab it is reputed to possess anthelmintic properties.

Very little was known regarding the chemical composition either of the stem or of the seeds of *Cuscuta reflexa*, till the author undertook its investigation. Barbey³ in 1895, working on another variety namely *C. ethiolum* isolated from it a yellow amorphous colouring matter called by him cuscutin. He also detected the presence of a small amount of a crystalline substance having a faint odour of coumarin. From the seeds Dymock in 1890 isolated quercetrin, and a bitter and glucosidal resin. An alkaloidal principle was also detected which failed to give any colour reaction.

The author thoroughly examined both the stems and the seeds of *cuscuta reflexa* and as a result of the present work the following substances have been isolated in a pure form :

- | | | |
|-------------------------------------|--------------------|--------|
| 1. Cuscutin— $C_{15}H_{12}O_9$ | m.p. 209° | (0.2%) |
| 2. Cuscutalin $C_{18}H_{10}O_4$ | m.p. 68° | (1.0%) |
| 3. Wax— 74° | | (0.1%) |
| 4. Fixed oil | | (3.0%) |
| 5. Amarbalin— $C_{18}H_{16}O_7H_2O$ | m.p. 234° | (0.1%) |
| 6. Amorphous bitter resin | | (1.0%) |

The first three substances have been isolated from the stems and the last three from the seeds.

Cuscutin⁴ $C_{15}H_{12}O_9$ is a pale yellow crystalline substance crystallising from water in plates. It dissolves in most of the organic solvents with an orange yellow colour; and in alkalis with a bright orange yellow solution, being precipitated on the addition of acids. It gives a green precipitate with ferric chloride, pale yellow precipitate with lead acetate and white precipitate with silver nitrate. It was non-glucosidal in character and gave negative tests for flavones and anthraquinones. It formed a di-acetyl, a di-carbethoxy and a di-methoxy derivative showing thereby that it contains two phenolic hydroxy groups.

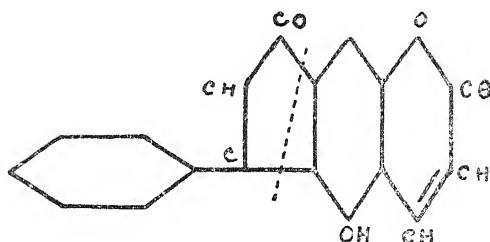
A dilute solution of potassium permanganate was rapidly decolourised.

Cuscutalin $C_{18}H_{10}O_4$ is a white crystalline substance crystallising in flakes from ethyl alcohol and in well-defined needles from petroleum ether. Although completely insoluble in water, cuscutalin is not precipitated from its solution in alcoholic caustic potash in which it dissolves with a beautiful yellow colouration, on the addition of water. It can however be precipitated from its aqueous alcoholic alkaline solutions by means of carbon-dioxide or acids. It does not form any derivative with hydroxylamine, phenylhydrazine or semi-carbazide nor reduces Fehling's solution, but Tollen's reagent is gradually reduced by it. These reactions at once place it in the group of $\Delta^{\alpha\beta}$ lactones.

It formed a mono-acetyl and mono-carbethoxy derivative, gave a faint red colouration with alcoholic ferric chloride; and hence contains one phenolic hydroxy group. It is unsaturated and showed the presence of two double bonds in the molecule. Cuscutalin, being a hydroxy lactone was easily acted upon by concentrated hydrochloric acid to form anhydro-cuscutalin. Anhydro-cuscutalin gave no acetyl derivative. On fusion with caustic potash formic acid, cinnamic acid and an aromatic unsaturated hydro-carbon was obtained. On oxidation with alkaline potassium permanganate benzaldehyde was detected.

These reactions clearly show that cuscutalin contains most probably a pyrone nucleus in its molecule, since on complete methylation after saponifying the lactone with caustic potash a dimethoxy mono-methyl ester was obtained. On acidifying the product after saponifying cuscutalin an isomeric lactone is obtained.

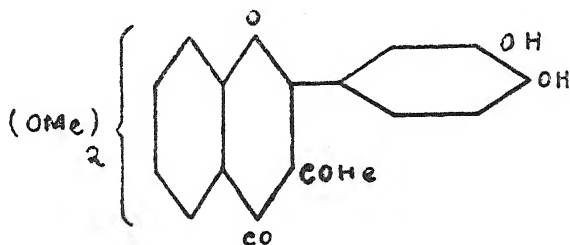
The following configuration is provisionally suggested for cuscutalin since it responds to all the reactions obtained above:



The hydrolysis of the substance at the place marked will give cinnamic acid and the free hydroxyl group of the benzene nucleus will combine with the carboxyl of the lactone on saponification to form an isomeric lactone. It has also got two double bonds which can easily take up halogens.

Amarbelin⁵ $C_{18}H_{16}O_7$; H_2O is pale yellow lemon coloured crystalline substance crystallising in tufts from water and in clusters of needles from dilute alcohol. It loses this water of crystallisation on being heated at 120° for twelve hours, being turned into a yellowish brown stuff. It melts at $234^\circ C$. Preliminary examination readily revealed its nature as a colouring matter belonging to the flavone group. It gave a deep green colour with ferric chloride and formed a di-acetyl and a di-benzoyl derivative and hence contains two phenolic hydroxy groups. Zeisel's determination of the methoxyl groups in the usual manner established the presence of three methoxyl groups in the molecule. This proves it to be a di-hydroxy-tri-methoxy flavone. Caustic potash fusion of amarbelin was undertaken and protocatechuic acid was identified as a fission product. The phenol could not be identified but it was definitely shown not to be phloro-glucinol. Amarbelin on being allowed to oxidise in atmosphere in alkaline solution was found to be sufficiently stable. This points to a methoxyl being in position 3. The remaining two methoxyl groups are necessarily present in the fused benzene nucleus. Demethylation of amarbelin by means of hydriodic acid gave a product which was not identical either to quercetin or morin the two penta-hydroxy flavones known; and was

not stable to aerial oxidation thus giving further support for one of the methoxyl being in position 3. The demethylated product has been named as amarbelitin. The following configuration is at present suggested for amarbelin the positions of the two methoxyl groups being uncertain but they are of 5 : 7.



The fixed oil isolated from the seeds⁶ has been shown to consist of lenolenic acid 9.92%; linolic acid 17.26%; oleic acid 25.58%; steric acid 27.2%; palmitic acid 11.5% and unsaponifiable matter 1.8%. The unsaponifiable matter was shown to consist mainly of a phytosterol m.p. 134—135°C. which crystallises in fine silky needles from alcohol. The acetyl derivative melts at 124—125°C.

It is very interesting to note that amarbelin which is a flavone colouring matter and has been found to exist in the seeds of *Cuscuta reflexa* has no chemical relationship with cuscutin the colouring matter of the stems of the plant. It may be said that with the increase of our knowledge with regard to the chemistry of cuscutin and cuscutalin some relationships may be discovered which may throw light on the natural synthesis of these products.

Pharmacologically amarbelin is supposed to give interesting results since calycopterin isolated from *Cabycopteris flourobonda* which was shown to be a dihydroxytetra-methoxy flavone was found to be toxic to tape and round warms suspended in bile solution containing little sodium carbonate.⁷

CHAPTER VI

Legenaria vulgaris Seringe

The bitter gourd known by the name of *Legenaria vulgaris* Seringe in Botany, 'Tumbi or Kaddu' in Hindi; 'Lau' in Bengali; and Shorakai in Marathi is a creeping plant belonging to the natural order *Cucurbitaceae*. The fruit of this is globular in size at times enormously big and the shell of the dried fruit is commonly used in India as a vessel for holding all kinds of fluids, and also for making guitars. There are generally two varieties, a sweet one eaten as a wholesome vegetable by most Indians and the other a bitter one. The seeds of the fruit are greyish black, flat at the sides and elliptical, surrounded at times by a border which is inflated at the sides and notched at the apex.¹

With regard to the medicinal properties the seeds are considered to be one of the four cold curcubitaceous seeds of the ancients. They are reputed to be very cold yielding an oil which is used as an application for headache. Dr. B. Brown² noticed the poisonous properties of the bitter variety the symptoms observed being similar to those after poisoning by elaterium or colocynth.

There appears to be practically no work done on this drug prior to the present investigation. The oil from the seeds has been worked up in details and the different constituents separated and their percentages determined.³ The ash had the following composition: potassium, sodium, calcium, aluminium, sulphates, phosphates, chlorides, carbonates and silica.

The oil (19.1%) was light yellow in colour and contained no nitrogen or sulphur. On saponification it gave a mixture of fatty acids which were resolved into unsaturated (47.53%) and saturated (52.47%) acids by the famous Twitchell's lead salt alcohol method. The separation was practically quantitative. The unsaturated acid was then treated according to the method of Eibner and Muggenthalor⁵ in order to find out

the percentage and the nature of its constituents. It was found that it consists of oleic acid (33.09%) and linoleic acid (66.91%). The saturated acids were converted into their methyl esters and fractionally distilled at 0.5 mm. pressure. From the saponification values and iodine values and assuming that every fraction consists of only two acids the percentage of palmitic and stearic acids was determined in the different fractions. The last fraction, whose molecular weight was higher than that of stearic acid, was supposed to contain arachidic acid. In this way the saturated acid fraction was found to consist of palmitic acid (36.48%); stearic acid (59.05%); arachidic acid (1.43%) and unsaturated acids (3.04%).

The unsaponifiable matter was shown to consist mainly of sitosterol which crystallised out from alcohol in colourless needles melting at 131—132°C.

CHAPTER VII

Bark of Terminalia arjuna Bedd

Terminalia arjuna called 'Arjuna' in Hindi and Bengali, 'Kukubha' in Sanskrit and 'Vellai-maruda-maram' in Tamil, is a large deciduous tree attaining a height of 60 to 80 ft. The bark is 1/3 in. thick, smooth pinkish grey. It belongs to the natural order *Combretaceae*. It is common throughout the Sub-Himalayan tracts of the United Provinces, Delhi, Deccan, Burma, and Ceylon. The bark is considered by the Sanskrit writers to be a cardiac tonic, and as such is prescribed in heart diseases even to this day with marked success. A decoction of the bark is used as a wash in ulcers and cancers.

Ghoshal¹ in 1909 made a detailed study of its chemical composition and showed that it contains a body of the nature of glucoside along with tannins, sugars and a colouring matter. He also found that the ash contains calcium and sodium. Cho-

pra and Ghosh², later on in 1929 made a careful analysis but could not find any alkaloid or glucoside. They however reported the presence of an organic acid, a phytosterol, an organic ester and some colouring matter. Ram and Guha in 1930 also detected two organic acids and a phytosterol.

The author made a systematic examination of the bark and found that it contained the following substances:

1. Arjunin. $C_{26} H_{32} O_{11}$ m.p. 192° (0.1%)
2. Amorphous red colouring matter. (1.0%)
3. Arjunetin. $C_{11} H_{18} O_4 H_2 O$ m.p. 215°
(0.25%)
4. Sugars

The ash from the bark had the following qualitative composition: Potassium, sodium (traces), aluminium, calcium, magnesium (traces), silica, carbonates, phosphates, chlorides and sulphates.

The presence of a phytosterol claimed to have been isolated by Chopra and Ghosh and Ram and Guha, could not be detected. Since both arjunin and arjunetin give a red colour with sulphuric acid which changes to deep violet on standing and the reaction being very sensitive a slight contamination of any of these might have led the previous workers to the idea that a phytosterol is present, for in reactions for sterol sulphuric acid is employed and a colour change from red to violet is taken as a test.

Arjunin has been obtained from the benzene extract of the drug. It is a colourless crystalline substance having no taste or odour. It crystallises from a large volume of benzene in needles and from glacial acetic acid in small prisms m.p. $192^{\circ}C$. It has the molecular formula $C_{26} H_{32} O_{11}$. It gives a green colour with ferric chloride and hence is phenolic in character. It dissolves in sodium-bi-carbonate with much effervescence and deposits the sodium salt. It also gives a silver salt and a lead salt. These reactions at once show that it contains at least one car-

boxylic radical. It also forms a di-acetyl and a di-benzoyl derivative, showing thereby that it contains two phenolic hydroxy groups. A penta-nitro-derivative has also been obtained.

Arjunetin $C_{11} H_{18} O_4$, $H_2 O$ is a white crystalline substance which loses one molecule of water on being heated at 110° for eighteen hours. It crystallises from water in well defined small plates melting at $215^\circ C$. It does not give any colour with ferric chloride nor forms any derivative either with acetic anhydride or benzoyl chloride. It also does not show the presence of a carbonyl group. It, however, reduces Tollen's reagent very readily and gives a beautiful yellow colouration with alcoholic caustic potash. It also decolourised bromine water and alkaline potassium permanganate. These reactions, which are shared by some of the natural coumarins and other lactones point to the irresistible conclusion that arjunetin may contain at least one lactone ring in its structure. Arjunetin can also be easily saponified by refluxing with alcoholic caustic potash and on acidification as isomeric lactone is formed.

Pharmacological action

According to Ghoshal the drug acts as a powerful cardiac stimulant and tonic. It also acts as a haemostatic. He also recommended its use as a diuretic. Koman⁵ found that the decoction of the bark was not at all useful in cases of valvular diseases of the heart. Chopra and Ghosh mentioned that the drug produces no stimulating effect on the heart nor it has any marked di-uretic properties. They attribute any therapeutic effects produced by the drug, to the large calcium content present in the bark. Recently however caius, Mhaskar and Issac⁶ reported that *Terminalia arjuna* had di-uretic properties and cardiac stimulating effect. It is believed that the physiological and pharmacological studies of Arjuna and arjunetin, both of which are soluble in water, may greatly contribute to the solution of this much vexed question.

CHAPTER VIII

Amylase from Trapa bispinosa Roxb

Trapa bispinosa is an aquatic plant belonging to the natural order *Onagraceae*. It is known as 'Singhara' in Hindi and 'pani-phal' in Bengali. The kernels of the fruit are eaten as a wholesome food by large communities of the poorer classes in Northern India. The nuts are considered by Indian physicians as cool and useful in bilious affections and diarrhoea.

The amylase¹ from the fruit has been extracted by means of water. The activity has been studied by estimating the amount of maltose formed by the famous method of Willstätter and Schudel². This method which is one of the most rapid methods for the estimation of reducing sugars, gives results which are correct to 0.1% with 1 % sugar solution, and hence can be utilised for enzyme work where comparative values are only needed. The velocity constants were calculated according to Euler and Savanberg³ since the reaction follows a monomolecular course until 50-60% of the substrate is decomposed. The substrate employed was soluble starch prepared according to the method of Litner. It was found that the enzyme activity is increased practically ten times by dialysing it for 20 to 40 hours in collodion bags against distilled water. The optimum pH for the enzyme lies between 5.2-5.6 and the optimum temperature between 50-55°C. The amylase has been shown to consist mainly of dextrogenic amylase or β -amylase.

SUMMARY

Plant	Natural order	Vernacular name	Parts examined	Constituents separated	m. p.	Formula	Characters
1. <i>Boerhaavia diffusa</i> , Linn. ...	Nyctiganae	Punar-nava	Plant	(a) Punarnavine. (b) Boerhaavie acid (c) Potassium nitrate	$\frac{235}{108-9}$...	$\frac{..}{C_{10}H_{13}O_3}$ KNO_3	Alkaloid
2. <i>Citrullus colocynthis</i> , Schrad. ...	Cucurbitaceae	Indrayan	Roots	(a) elaterin (b) Hentriacont (c) Saponins	$\frac{230}{67}$...	$\frac{C_{28}H_{38}O_7}{C_{31}H_{64}}$..	di-hydroxy monoacetyl lactone ..
3. <i>Cuscuta reflexa</i> , Roxb. ...	Convulvolaceae	Amarbel	Stems and seeds	(a) Cuscutin (b) Cuscutalin (c) Fixed oil (d) Amarbelin	209 68 ... 234	$\frac{C_{15}H_{12}O_9}{C_{18}H_{10}O_4}$ $\frac{..}{C_{18}H_{16}O_7H_2O}$..	di-hydroxy yellow colouring matter mono-hydroxy lactone .. dihydroxy-trimethoxy flavone ..
4. <i>Lagenaria vulgaris</i> , seringe.	Cucurbitaceae	Lauki	Seeds	Fixed oil	..	..	..
5. <i>Terminalia Arjuna</i> , Bedd.	Combretaceae	Arjun	Bark	(a) Arjunin (b) Arjunetin (c) Colouring matter	192 215 ..	$\frac{C_{26}H_{32}O_{11}}{C_{11}H_{18}O_4H_2O}$..	dihydroxy carboxylic acid Lactone ..
6. <i>Trapa bispinosa</i> , Roxb. ...	Onagraceae	Singhara	Fruits	Amylase	..	..	Optimum pH 5.2-5.6; optimum temperature 50-55.

CHEMICAL EXAMINATION OF THE SEEDS OF PHYSALIS PERUVIANA OR CAPE GOOSE BERRY

PART II

By MAHADEO PRASAD GUPTA AND JAGRAJ BEHARI LAL

Physalis Peruviana (N. O. Solanaceae) called cape goose berry in English and Makoi in Hindustani is cultivated in India and hardly differs from *Physalis Minima* Linn, except in its large size and more oblong berry. It affords an excellent fruit and is much cultivated in the country. The berries are globular with slight elongation, about $\frac{3}{4}$ " in length and breadth and having numerous pale yellow tiny seeds embedded in juicy pulp. The seeds constitute 4.5-5.0 per cent of the weight of the husk-free fresh ripe berries. The seeds have been submitted to a detailed chemical examination and as a result it is shown that the seeds contain 6.28% of a pale yellow semi-drying oil which has been worked up in detail as described in the experimental part of the paper. No alkaloid or glucoside could be detected but the presence of an amorphous saponin has been established.

Experimental

The dried seeds of the berries were collected as described in Part I and were ground with great difficulty owing to their small size and hardness. 50 gms. of the crushed seeds were successively extracted with benzene and alcohol in a soxhlet's apparatus. On subsequent evaporation of the solvent and drying of the extract at 100° to a constant weight the following results were obtained:

Benzene Extract : Light yellow oil, yield 6.23%.

Alcoholic Extract: Tasteless, light brownish syrupy mass containing some oily or fatty matter and giving a faint greenish coloration with ferric chloride. Yield 3.58%.

The seeds when completely burnt in a porcelain dish left 7.46% of greyish white ash. The ash contained the following positive and negative radicals: potassium, sodium, iron, calcium, aluminium, phosphate, silica and chloride.

For complete analysis 2.8 kgs. of the crushed seeds were exhaustively extracted with benzene in a 5 litre extraction flask. The combined benzene extracts on complete distillation of the solvent gave 182 gms. of a pale yellow oil of very thin consistency. The purification and the constituents of the oil are described separately. The oil free powder after removal of the traces of benzene was completely extracted with rectified spirit. The combined extract which was tasteless and light brownish yellow in colour was concentrated and then allowed to stand for several days when no crystalline stuff separated. It was then repeatedly extracted with hot benzene in order to free it from oil. The alcoholic extract gave a very light green coloration with alcoholic ferric chloride and no precipitate with alcoholic lead acetate. On dilution with water it gave a little flocculent white precipitate which was filtered with great difficulty at the pump and after drying in vacuum desiccator melted at 87°-89°C. and was brownish in colour. The amount being only .3 gm. it could not be obtained pure.

The diluted alcoholic extract gave no precipitate with lead acetate but a pale yellow precipitate was obtained on addition of a slight excess of basic lead acetate. The precipitate was filtered at the pump, well washed with hot water and then decomposed in alcoholic suspension with sulphuretted hydrogen. The alcoholic filtrate and washings from the resulting lead sulphide deposited globules but no crystalline stuff. It gave definite tests for saponins such as froth on shaking with water, a blue coloration with a solution of potassium ferricyanide

and ferric chloride, reduction of mercuric chloride to mercurous chloride, reddish violet coloration with con. sulphuric acid.

The filtrate and washings from the basic lead lake was concentrated on the water bath after removal of lead as lead sulphide but did not deposit any crystalline stuff even on keeping for several days. It gave an osazone which after crystallisation from alcohol melted at 203° and was identified as phenyl glucosazone thus proving the presence of glucose.

Examination of the Oil

The crude oil was digested with animal charcoal and filtered through a hot funnel. The purified oil was freed from traces of benzene by heating over water bath and finally in vacuum desiccator. It is slightly optically active having a small rotation in chloroform $(\alpha)^{20} = -0.38^{\circ}$. The fatty acids obtained after saponification of the oil is optically inactive, which shows that the rotation is due to the sterol present. The oil burns with a non-sooty, odourless flame and gives positive colour reactions for sterols. The oil is tasteless, semi-drying and free from nitrogen and sulphur. The physical and chemical constants of the oil are (R. D.)²⁷ = 0.881; remains clear upto -10°C . but becomes thick; acid value = 39.06; saponification value = 179.6; acetyl value = 41.58; unsaponifiable matter = 0.4%; Hehner's value = 93.4; iodine value = 128.5.

150 gms. of the oil were saponified with excess of alcoholic caustic potash and after complete removal of alcohol the resulting soap was freed from alcohol as completely as possible and then repeatedly extracted in the cold with ether in order to remove the unsaponifiable matter. The soap was dissolved in water and decomposed with dilute sulphuric acid on the water bath and then the fatty acids removed by extraction with petroleum ether. The petroleum ether solution of fatty acids was washed free from traces of sulphuric acid in a separating

funnel and then dried over anhydrous sodium sulphate, filtered and petroleum ether distilled off. The mixed fatty acids have $(R. D.)_{25} = 0.8826$; neutralisation value = 172.2; mean molecular weight = 326.1; iodine value = 114.45.

100.00 gms. of mixed fatty acids were separated into saturated and unsaturated acids by the Twitchell's lead salt alcohol method as this leads to more quantitative separation than by the lead-salt ether method. But during the separation of unsaturated acids, a small amount of resinous acids insoluble in petroleum ether but soluble in ether, also separated, and it is to their presence that the mean molecular weight of the mixed fatty acids is so high.

Table I

Acids	% in mixed acids	% in the oil	iodine value	Mean molecular weight
Saturated ..	13.40	12.52	2.7	286.2
Unsaturated ..	86.60	80.59	134.2	278.7

Elaidin test for the liquid acids—The liquid acids gave a positive test for elaidic acid.

Oxidation of unsaturated acids with potassium permanganate—10 gms. of the acids were dissolved in aqueous caustic potash and oxidised by solution of potassium permanganate at room temperature with constant stirring and after the reaction a current of SO_2 was passed to dissolve the precipitated manganese-dioxide. The insoluble oxidation product was filtered from it by successive extraction with ether and boiling water dydroxy stearic acid melting at $131-32^\circ C.$ and tetra hydroxy stearic acid (sativic acid) melting at $164-65^\circ C.$ were isolated showing thereby the presence of oleic and linolic acid, hexa-hydroxy stearic acid was entirely absent showing the absence of linolic acid.

The constituents of the unsaturated acids were quantitatively estimated by means of their bromine addition products as recommended by Jamieson and Baughmann. The hexa-bromo-derivative of linolenic acid is insoluble in cold ether, since no precipitate insoluble in ether was formed, the absence of linolenic acid was confirmed. The ether soluble portion was dissolved in petroleum ether and cooled when crystals of linolic tetra bromide (m. p. 113-114) were separated showing the presence of linolic acid. The residue was evaporated to dryness and the bromine content estimated. The following table contains the data regarding the analysis of the bromo-derivatives.

The iodine value of the mixture of unsaturated acids was found to be 134.2. The proportion of linolic acid and oleic acid calculated by the help of the following equations :—

$$\begin{aligned} X + Y &= 100 \dots\dots\dots (1) \\ 90.07 X + 181.14 Y &= 100 I \dots\dots (2) \end{aligned}$$

where X and Y are percentages of oleic and linolic acids respectively and I the iodine value of unsaturated acids and are given in Table II.

Table II

		% in the unsaturated acids	% in the total fatty acids	% in the original oil
Oleic Acid	.. ..	51.55	44.64	41.69
Linolic Acid	.. ..	48.45	41.96	39.19

Table III

Wt. of the unsaturated acids taken.....	5.6920 gms.
Linolic tetra bromide insol. in pet. ether....	3.3712 gms.
Residue (dibromide & tetra bromide).....	6.5843 gms.
Bromine content of the residue.....	32.1%
Dibromide in the residue 72.5% or.....	4.7720 gms.

Tetra bromide in the residue 27.5% or.....	2.2780 gms.
Total tetra bromide found.....	5.6492 gms.
Linolic acid equivalent to tetra bromide.....	2.6360 gms. or 46.40%
Oleic acid equivalent to dibromide.....	3.0460 gms. or 53.60%

Table IV gives the percentage of oleic and linolic acids in the unsaturated acids calculated from the above data.

Table IV

			% in the unsaturated acids	% in the total fatty acids	% in the original oil
Oleic acid	..	..	53.60	46.42	42.37
Linolic acid	..	..	46.40	40.18	37.53

The theoretical iodine value of a mixture consisting of 53.6% of oleic acid and 46.42% of linolic acid is 132.29, which agrees fairly well with the observed iodine value of the unsaturated acids (134.2).

Saturated Acids

The saturated acids separated by the lead-salt-alcohol method were freed from traces of liquid acids by pressing over porous plate. The acids thus obtained were perfectly solid, yellowish white in colour and melted between 54-56°C. The methyl esters of the mixed saturated acids (5.04 gms.) were prepared by the usual method.

The mixture of pure methyl esters was subjected to fractional distillation under diminished pressure, the boiling points and the pressures being recorded. The iodine values and the saponification values of the different fractions were determined and the mean molecular weight calculated. The percentages

of the acids were determined in the different fractions by means of these mean M. W. and the iodine value.

Table V contains the result of the fraction and table VI the result of analysis.

Table V

Fraction	B.P.	Pressure in mm.	Wt. in gms.
1.	160—175°	2.	4.4720
2.	175—185°	2.	2.3296
3.	Residue	2.	2.2944

The percentage of the various acids in the total saturated acids is given in table VI.

Table VI

Acids	% found in the saturated acids	% in the original oil
Palmitic	52.38	6.56
Stearic	43.38	5.45
Arachidic	1.11	0.14
Unsaturated acids	2.97	0.37

Examination of the Unsaponifiable Matter

The ethereal extract of the solid soap after complete removal of ether was dissolved in 150 c.c. of distilled water and the resulting solution was repeatedly extracted with ether. The combined ethereal extracts after a few washings with water was dried over sodium sulphate and ether completely distilled off. The residual crystalline stuff on repeated crystallisation from

Table VII

Fraction	Iodine value	Sap value	M. Wt.	Unsaturated acids gm. %	M. Wt. of the esters of saturated acids	Palmitic acid gm. %	Stearic acid gm. %	Arachidic acid gm. %
1	2.3	204.5	274.3	0.0692 1.55	270.9	4.076 91.12	0.8744 1.96	.. ..
2	3.5	195.1	287.6	0.0552 2.36	287.4	0.9184 35.13	1.2788 54.90	.. ..
3	9.9	187.5	299.2	0.1528 6.66	299.8	.. ..	1.9164 83.60	0.1116 4.42

small quantity of rectified spirit was obtained as silky needles melting sharp at 131° . It gave the various colour reactions of sterols and was optically active, $(\alpha)_D^{25} = -34.04$ in chloroform (C, 1.7885). Sample crystallised from chloroform and air dried was combusted. (Found C, 78.40; 78.42; H, 10.52, 10.49; $C_{28}H_{44}O_3$ requires C, 78.50; H, 10.28 per cent). It is a new sterol and to it this provisional formula is given.

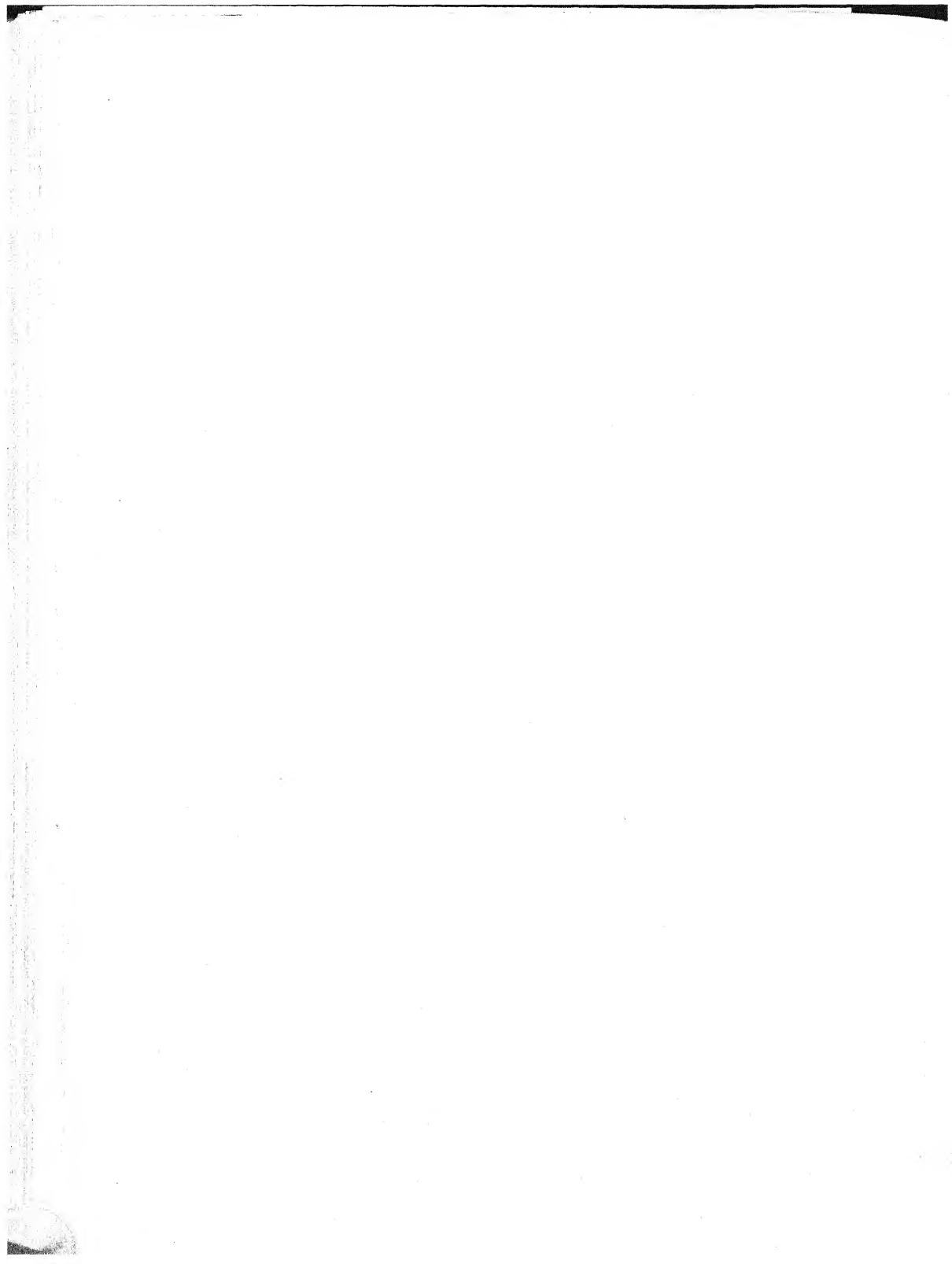
Summary

Oleic acid.....	42.37
Linolic acid.....	37.53
Palmitic acid.....	6.56
Stearic acid.....	5.45
Arachidic acid.....	0.14
Unsaponifiable matter.....	0.40

The authors wish to express their indebtedness to Dr. S. Dutt, D. Sc., P.R.S., for his kind interest in the work.

Reference

1. Twitchell, Journal Ind. Eng. Chem., 1921, 13, pp. 806-807.
2. Jamieson and Baughmann, Amer. Chem. Soc., J.M., 1920, 42, p. 1198.



THE CHEMICAL EXAMINATION OF THE FRUITS OF SOLANUM XANTHOCARPUM SCHARD AND WENDLE

Part I. The Constituents of the Oil from the Seeds

By MAHADEO PRASAD GUPTA AND SIKHIBHUSHAN DUTT

Solanum Xanthocarpum (N. O. Solanaceae) commonly known as Bhatkatya in Hindi and Kanta-Kari in Sanskrit and Bengali is common throughout India. The description of the plant and its medicinal properties are given in great detail in Dymock : *Pharmacographica Indica*—1891, II, 557 and Basu and Kirtikar : *Indian Medicinal plants*, II, 896, 1918. The plant is of great importance in Hindu medicine, as being useful in fever, cough, asthma, constiveness, heart disease, toothache etc.

So far scarcely any work of a chemical nature has been done on the fruits and the present investigation was undertaken to put the fruits to a thorough chemical examination. The benzene extract of the seeds yielded an oil of greenish yellow colour and some crystalline matter which deposited on standing. The purification and constitution of the crystalline matter is being investigated.

Experimental

33.15 kilograms of the fresh fruits were dried, crushed and the pericarp separated mechanically. The dry seeds constituted 20.71%, and the pericarp 4.62% and the moisture 74.67% of the fresh fruits by weight. The ash of the crushed fruit contained 44.38% of water soluble and 55.62% of water insoluble inorganic material, and contained the following positive and negative radicals :—

Potassium, iron, calcium (in traces), magnesium, silica, carbonate, chloride, sulphate and phosphate.

30 grams of the crushed seeds were successively extracted with various solvents in a Soxhlet's apparatus and the extracts were dried at 100°C. when the following results were obtained :—

Benzene extract—The extract was a greenish yellow oil which deposited some crystalline matter on standing. Yield 19.28%.

Chloroform extract—The extract was of yellowish brown colour, and gave positive tests for alkaloids, soluble in acids, and also in caustic soda with yellow colour, forms neutral as well as basic lead salts, gives no colour with FeCl_3 , yield 3.2%.

The ethyl acetate extract—(1.65%), the acetone (1.62%) as well as the alcoholic extracts (3.39%) were of yellowish brown colour and showed the same reactions as the chloroform extract and were very slightly bitter in taste.

Extraction of the oil—2.2 kilograms of the powdered seeds were exhaustively extracted with benzene when 418 gms. of greenish yellow oil having characteristic odour were obtained. The crude oil was purified with animal charcoal and Fuller's earth. The oil was of bright yellow colour when viewed in thin layers and greenish yellow in thick layers.

Examination of the oils—The oil does not contain nitrogen or sulphur. It burns with slightly smoky flame and is slightly optically active showing a rotation of $[\alpha]_D^{25} = -1.35$ in chloroform. On examination it was found to be a semi-drying oil. The physical and chemical constants of the oil are :—

Specific gravity, 0.9240 at 27°C.; Solidifying point, does not solidify upto -11° but becomes thick; Acid value, 70.78; Acetyl value, 40.4; Saponification value, 182.5; Hehner's value, 94.9; Iodine value, 124.3; Unsaponifiable matter, 1.2%.

150 gms. of the oil were saponified in the usual manner with alcoholic potash and the unsaponifiable matter extracted with

ether in a big separating funnel. The fatty acids were then extracted in the usual manner, the mixed fatty acids have the following constants:—Consistency liquid; Specific gravity 0.8775 at 27°C.; Neutralisation value 173.9; Mean molecular weight 322.7; Iodine value 121.37.

The mixture of the fatty acids (52 gms.) were then separated into saturated (solid) and unsaturated (liquid) acids by the Twitchell's lead salt alcohol method (Jour. Ind. Eng. Chem., 1921, 13, 806). During the separation of saturated and unsaturated acids, a small quantity of resinous acid insoluble in petroleum ether but soluble in ether also separated and it is to their presence that the mean molecular weight of the mixed acids is so high. Table I gives the percentage, iodine value and the mean molecular weight of the saturated and unsaturated acids.

Table I

Acids	% in mixed acids	% of the oil	Iodine value	Mean molecular weight
Saturated ..	16.62	15.77	4.24	285
Unsaturated	83.38	79.11	129.7	279.8

Examination of unsaturated acids—The unsaturated acids separated by the above method showed beautiful green fluorescence, and their constituents were determined quantitatively by the method of Jamieson and Baughmann (Jour. Am. Chem. Soc., 1920, 42, 1197) by preparing their bromine addition products. The hexabromo-derivative of linolenic acid is insoluble in cold ether, since no precipitate insoluble in ether was formed, the absence of linolenic acid was confirmed. The ether soluble portion was dissolved in petroleum ether and cooled when crystals of linolic tetra bromide (m.p. 113-114) were separated showing the presence of linolic acid. The residue was evaporat-

ed to dryness and the bromine content estimated. Table II contains the results of the analysis of the bromine addition products.

Table II

Weight of unsaturated acids taken.....	5.6192 gms.
Linolic tetra bromide insoluble in petro- leum ether.....	2.8294 gms.
Residue (dibromide and tetra bromide).....	7.4552 gms.
Bromine content of the residue.....	42.33%
Dibromo oleic acid in residue...64.1%or...	4.7800 gms.
Tetra bromo linolic acid in residue...35.9%or	2.6770 gms.
Total tetra bromide found.....	5.5064 gms.
Linolic acid equivalent to tetra bromide	2.5700 gms.
or 45.74%	
Oleic acid equivalent to dibromide	3.0490 gms. or 54.26%.

The proportions of the linolic and oleic acids in the unsaturated acids was also determined from the iodine value of the liquid acids.

Table III(a) contains the percentage of the linolic and oleic acids in the unsaturated acids, and the percentage of their glycerides in original oil calculated by bromine addition method, and Table III(b) percentage calculated by iodine method.

Table III (a)

Acid		Found % by bro- mine addition pro- ducts	% in the total fatty acids	% of the origi- nal oil
Oleic acid	..	54.26	45.23	42.93
Linolic acid	..	45.74	38.14	36.19

Table III (b)

Acid			Calculated % (by iodine value)	% in the total fatty acids	% of the ori- ginal oil
Oleic	..	..	56.38	47.00	46.71
Linolic	..	..	43.62	36.40	34.55

The theoretical iodine value of a mixture consisting of 54.26% of oleic acid and 45.74% of linolic acid is 131.7, which agrees fairly well with the observed iodine value of the unsaturated acids (129.7).

Examination of the saturated acids—The saturated acids separated by the lead salt alcohol method were freed from traces of liquid acids by pressing over porous plate. The acids thus obtained were perfectly solid, slightly yellowish white in colour melting between 52° — 56°C.

The mixture of the saturated acids was converted into the methyl esters (10 gms.) and fractionally distilled under low pressure, the boiling points and the pressures being recorded. The iodine values and the saponification values of the different fractions were determined and the mean molecular weight calculated. The M. W. of the methyl palmitate is 270.3 and that of methyl stearate 298.4. The M. W. of the three fractions lie between these two values and indicate a mixture of the two. The M. W. of the last fraction is greater than 298 and hence contains the ester of an acid of greater M. W. than stearate and probably arachidate. The percentages of the acids were determined in the different fractions by means of these mean M. W. and the iodine value (Jour. Am. Chem. Soc., 1920, 42, 152).

Table IV contains the result of the fraction and Table V the results of analysis.

Table IV

Fraction	B.P.	Pressure mm.	Weight in gram of the fraction
1.	200—210	1.2	1.6800
2.	278—280	0.7	3.2378
3.	280—281	0.7	2.7174
4.	Residue	0.7	2.0420

Table V

Acids	% found in the saturated acids	% in the original oil
Palmitic	34.07	5.37
Stearic	61.93	9.77
Archidic (?)	2.20	0.35
Unsaturated	1.79	0.28

Examination of the unsaponifiable matter—The unsaponifiable matter obtained by ether extraction of the soap was washed in ethereal solution repeatedly with water. The dried ethereal solution was distilled when the yellowish white amorphous matter was obtained. It was repeatedly crystallised from minimum quantity of alcohol, and thus two sets of perfectly white flakes were obtained with different melting points, and thus proving that the unsaponifiable matter is a mixture of two sterols in addition to some sticky yellow colouring matter which is practically insoluble in cold alcohol. On recrystallising from alcohol twice, the first crop melted completely at 122° with

Table VI

Fraction	Iodine number	Sap. value	Mean M. W.	Unsaturated gms. %	Mean M. W. of esters of saturated acids	Acids		
						Palmitic gms. %	Stearic gms. %	Archidic (?) gms. %
1	2.76	203.45	275.9	.0357 2.12	275.5	1.2700 75.53	.2898 17.25	..
2	1.69	197.74	287.9	.0423 1.30	283.7	1.5830 48.9	1.4310 44.82	..
3	1.21	190.0	295.3	.0232 0.85	295.3	0.2815 10.36	2.2810 83.93	..
4	4.40	186.40	301.0	.0633 0.31	301.4	.. ..	1.6760 82.10	0.2020 9.89

previous shrinking at 92° , and the second at $142-43^{\circ}$ but without any sign of shrinkage before melting. They gave the various colour reactions of the sterol and were optically active, $[\alpha]_D^{32} = +16.24$ in chloroform ($C=1.2930$). One combustion of the sample crystallised from chloroform and air dried was done (found $C=75.5\%$; $H=11.1\%$). $C_{24}H_{44}O_3(?)$ requires ($C=75.8$; $H=11.6$ per cent). The other sample showed $[\alpha]_D^{32} = -83.45 (?)$ in chloroform ($C=0.6890$), the substance crystallised from alcohol and air dried was combusted. (Found $C=83.12$, 83.41 ; $H=11.42$, 11.66 , $C_{25}H_{42}O$ requires $C=83.8$; $H=11.7$ while $C_{26}H_{44}O$ requires $C=83.8$; $H=11.8$ per cent).

Summary

The examination of the oil showed the presence of the following substances:—

Oleic acid.....	42.93%
Linolic acid.....	36.18%
Palmitic acid.....	5.37%
Stearic acid.....	9.77%
Arachidic acid (?).....	0.35%
Unsaponifiable matter (a mixture of two sterols)...	1.2%

CONSTITUENTS OF THE SEEDS OF BLEPHARIS EDULIS, PERS. Part I

By JAGRAJ BEHARI LAL

Blepharis Edulis, Pers. synonymous with *Acanthodium Spicatum*, Debile belongs to the natural order of Acanthaceae. Under the local name of *utanjan* and the Persian name *Anjurah*, this Acanthaceous seed is universally sold in the Indian bazars as it is a standard Indian medicine. It is found in the Punjab, Sind and Persia. The plant bears yellow flowers and has numerous serrated leaves which are armed with prickles, and the stem is still more prickly and when it comes in contact with body it causes redness, burning, and it clings. The seeds are heart-shaped, flat, of a brownish colour and covered with long, coarse hairs. They are larger than those of sesame and altogether not unlike linseed. On the seeds being soaked in water, the hairs, disintegrate and produce a large quantity of viscid mucilage. Under the microscope each hair is seen to be made up of several columnar cells, each of which contains a spiral fibre, which on dissolution of the cell wall uncoils and imparts an unusual stringiness to the mucilage. "Medicinally, the seeds are considered to be attenuate, resolvent, diuretic, aphrodisiac, expectorant and deobstruent." (Dymock, *Pharmacographia India*, Vol. III, p. 41-42).

So far very little work has been done on the seeds of this plant. The only mention about the constituents of this seed is in Dymock (loc. cit.). The bitter principle of the seeds is described as a white crystalline body soluble in water, amyl and ethyl alcohol but insoluble in ether and petroleum ether and as giving a red colour with concentrated sulphuric acid,

a violet coloration with ferric salts and an agreeable odour of salicyl-aldehyde on treatment with sulphuric acid and potassium dichromate. The presence of a white crystalline non-bitter principle melting at 225° and giving no colour reactions with con. sulphuric acid and ferric salts has also been noticed. In view of this fact, a systematic chemical examination of the seeds has now been undertaken by the author. As the result of the present investigation a bitter glucoside "*Blepharin*" (yield 1.2%) melting at 222° with previous shrinking at 220° and having the formula $C_{16}H_{20}O_{11}$ and a tasteless nitrogenous compound having the formula $C_4H_6O_3N_4$, melting with decomposition at $225-226^{\circ}$ with previous darkening in colour at 218° and identified as dl-allantoin (yield 2.1%), have been isolated. The isolation of allantoin in more than 2 per cent yield from the seeds of *Blepharis Edulis* is not surprising since it is known to occur frequently in the plant kingdom. Schulze and Barbieri as long as 1882 (J. pr. Chem., (2), 125, 145-158) isolated allantoin from the young dried leaves of the Plane Tree (*Plantanus Orientalis*) and very recently d-allantoin $[\alpha]_{20D} + 920^{\circ}$ in water, along with dl-allantoin have been isolated from the leaves of *Plantanus Orientalis*. (R. Fosse, P. E. Thomas and P. De., Graeve. Compt. rend. 1934, 198, 1953). Occurrence of allantoin in all the possible parts of plants have been recently demonstrated such as in the beet juice (Abstr., 1897, II, 118), the seeds of *Datura Metal* (J. De., Plants, Chem. Zentr., 1910, i, 1622), the leaf buds of *Acerpseudoplataneus* and *Acercampestre*, from the barks of *Aesculus hippocastanum* and of *Acerpseudoplatanus* (Schulze and E. Booshard, Zeit. Physiol. Chem., 9, 420-444) and from the rhizomes of *Symphytum officinale* (Abstr., 1919, i, 60).

Experimental

An authentic specimen of the seeds of *Blepharis Edulis*, about a year old was obtained from the local market and was

ground to a coarse powder in a grinding machine. The powdered seeds when completely burnt left 7.23% of a greyish white ash. The following elements and radicals were detected in the ash:—Sodium, Potassium, Calcium, Magnesium, Iron, Silica, Alumina, Carbonate, Phosphate, Chloride, Nitrate, and Sulphate (the last in traces). In order to ascertain the general character of the constituents, 50 gms. of the powdered seeds were extracted successively in a Soxhlet's apparatus with various solvents in the order given below whereby the following amounts of extracts dried at 100° to constant weight were obtained.

1. *Benzene Extract*—3.72%. A dark reddish brown thick oil smelling strongly of the seeds was obtained.

2. *Chloroform Extract*—1.02%. It was a syrupy brown tasteless extract containing suspended globules of white fatty matter. Its alcoholic solution gave a greenish black colour with ferric chloride showing the presence of tannins and became milky on dilution with water.

3. *Ethyl Acetate Extract*—17.25%. It was a brown extract of extremely bitter taste and consisted of a white crystalline mass along with large amount of tannin matter, as it gave black coloration and then a black precipitate with ferric chloride, and a flocculent yellow precipitate with lead acetate solution and reduced Fehling's solution copiously. It gave no colour reactions with alkaloidal reagents.

4. *Alcoholic Extract*—6.04%. It was of a syrupy nature and slightly bitter in taste and contained a tasteless white crystalline mass. It reduced Fehling's solution copiously and gave a black coloration with ferric chloride.

5. *Test for Enzymes*—A quantity (50 gms.) of the ground seeds were macerated with distilled water at ordinary room temperature (22°C.) for two days with the addition of a little toluene to prevent bacterial action. The mucilaginous mass was filtered and the filtrate tested as usual for enzymes. Peroxidase, catalase, and invertase were totally absent but diastase was

present in minute quantity (Hydrolysis of Starch).

A preliminary examination for the presence of alkaloids was made with 200 g. of the powdered drug which was repeatedly extracted with Prollius fluid. The filtrate after concentration was extracted with dilute hydrochloric acid and the acid extract was treated with alkaloidal reagents with negative results.

For complete analysis 9.0 kg. of the powdered seeds in lots of .7 kg. were exhaustively extracted with benzene in a 5 litre round bottomed extraction flask. From the concentrated benzene extract 342 g. of a thick reddish brown, fragrant, semi-drying oil were obtained on complete removal of the benzene. The oil free powdered drug was successively extracted with rectified spirit. The first few extracts were reddish brown in colour and after that colourless extracts were obtained. The extraction was continued till a portion of the extract did not leave any appreciable amount of crystalline matter on complete evaporation of the solvent. The combined extract was concentrated on the water bath to one-seventh of its volume and on allowing to stand at ordinary temperature for about a week was filled with a large amount of crystalline matter, which was filtered at the pump with good suction. The residue (A) was washed with alcohol until it had assumed a white or at most a light brownish colour. Thus 230 gms. of a tasteless and greasy crystalline stuff were obtained. After repeated extraction with hot benzene in order to remove oily and fatty matter it became brown at 210° , softened at 215° and melted with decomposition at 218° . It is tasteless and almost insoluble in all the organic solvents and for crystallisation recourse was taken to boiling water in which it was readily soluble and separated on cooling in the form of glistening monoclinic prisms. The melting point of the substance rose to $225-226^{\circ}$ with previous darkening in colour at 218° after two crystallizations from boiling water and did not rise any further. The air dried substance has the composition $C_4H_6N_4O_3$ and contains no water of crystallisation.

Its solution is not coagulated by tannic acid and is non-respondent to the ninhydrin reaction of amino acids. It does not reduce Tollen's reagent and Fehling's solution. It does not give any coloration with neutral ferric chloride, nor any precipitate with lead acetate, basic lead acetate, calcium chloride or cadmium chloride. It dissolves in moderately strong mineral acids in the cold to colourless solution and in dilute ammonia and alkali hydroxides. On heating with con. nitric acid no yellow or brown coloration appears. It readily reduces alkaline permanganate even in the cold but acid potassium permanganate only on heating it; with alkali hydroxides ammonia is copiously evolved. It does not give positive results in carbylamine, Bulow's Biuret, and Murexide tests. With nitrous acid it evolved nitrogen. It gave with mercuric nitrate a white precipitate which is soluble in boiling water. (Found C, 30.83, 30.51, 30.47%; H, 4.08, 3.98, 3.79%; N, 35.9, 35.6% M. Wt. (ebulioscopically in water), 131.135. $C_4 H_6 O_3 N_4$ requires C, 30.42%, H, 3.8%, N, 35.4%, M. Wt. 150).

Action of con. nitric acid—Powdered substance (3 g.) was taken in a small porcelain dish and 30 c.c. of con. HNO_3 (sp. gr. 1.4) was gradually poured on it when it first puffed up and then crumbled to powder. The excess of acid was evaporated on the water bath when a slightly sticky granular stuff was left behind. It crystallised from small quantity of boiling alcohol in fine tiny needles. The air dried crystals fused at 200° to an opaque mass, evolved gas at $200-210^\circ$ and turned deep brown and decomposed at 225° and were identified as those of allanic acid. (Sample dried at 125° C; 23.29%; H, 2.51%, N, 34.72%. $C_4 H_5 N_5 O_5$ requires C, 23.65%, H, 2.46%, N, 34.48%). The silver salt prepared by the usual method darkened at 195° and decomposed with gas evolution at 199° (Found Ag, 34.94%; $C_4 H_4 N_5 O_5$ Ag requires Ag, 34.83%).

Solution of the substance (2 g.) in the smallest amount of ammonium hydroxide was allowed to stand in open air for

several days. On complete evaporation of water ammonium allantoate was obtained as crystalline powder. (Found C, 24.72%; H, 5.80%; N, 36.9%. $C_4H_{11}N_5O_4$ requires C, 24.86%; H, 5.70%; N, 36.37%).

By the action of aqueous caustic potash and subsequent precipitation with absolute alcohol potassium allantoate was obtained. (Found C, 22.21%; H, 2.78%; $KC_4H_7N_4O_4$ requires C, 22.42%; H, 2.60%). Similarly by taking aqueous caustic soda instead of caustic potash, sodium allantoate was obtained. (Sample dried over calcium chloride, C, 22.01%; H, 4.34%; $NaC_4H_7N_4O_4 \cdot H_2O$ requires C, 22.22%; H, 4.16%).

Preparation of Allantoin—20 g. of uric acid are suspended in 400 c.c. of water and dissolved by the careful addition of caustic soda in small quantity at a time and with constant stirring. The alkaline liquid is treated with a 5 per cent solution of 13 g. of potassium permanganate and well stirred. As soon as the solution is decolorised which is tested for by filtering a sample it is filtered from manganese dioxide at the pump and the filtrate acidified with acetic acid and evaporated (best in vacuo) until it crystallises. The crystals after three crystallisations from hot water melt with decomposition and effervescence at 225° after previous darkening in colour at 218° and this remained undepressed by admixture with the non-bitter principle. (literature m.p. of allantoin 229°).

Isolation of Blepharin—The filtrate and washings after the separation of allantoin were mixed together and after concentrating and allowing to stand for a few days did not deposit any crystalline stuff. It was then repeatedly extracted with hot ethyl acetate, after a few extractions with hot benzene in order to remove oily and fatty matter till the syrupy mass was no longer bitter. The ethyl acetate layers were decanted from the heavy viscous syrupy mass and after being mixed together were concentrated to one-seventh of their volume and on allowing to stand for a week became semi-solid due to separation of glistening

tiny needle which were filtered off at the pump after thinning with a mixture of 1 vol. of ethyl alcohol and 4 vol. of ethyl acetate. The residue on the filter pump was repeatedly washed with the same mixture till it had a white or at most a brownish white appearance. Some more of the crystalline stuff was obtained from the filtrate and washings after concentration and allowing to stand for a number of days. After removal of oily and fatty matter by extraction with hot benzene, it was repeatedly crystallised from hot alcohol till the air dried material melted without decomposition at $219-220^{\circ}$ with previous shrinking at 213° and the melting point did not rise any further by crystallisation from the same solvent. But after two crystallisations from acetone it was obtained as glistening stout needles and the air dried material melted at 222° after shrinking at 220° and further crystallisations from the same solvent did not raise the melting point. It is proposed to name this bitter principle as "*Blepharin*" in order to represent the generic name of the plant from which it is derived. It contains carbon, hydrogen and oxygen only.

Blepharin is sparingly soluble in cold water and much more in boiling. It is slightly soluble in cold acetone, amyl alcohol ethyl acetate, methyl alcohol and fairly in the hot. It is insoluble in ether, petroleum ether, benzene, chloroform, bromoform, and carbon tetra chloride. Caustic alkali and alkali carbonate solutions do not exhibit any dissolving action on it. It gives no precipitate in aqueous or alcoholic solution with silver nitrate, calcium chloride, ferric chloride, lead acetate, or copper acetate. With concentrated sulphuric acid it gives no coloration in the cold but a purple-red coloration appears immediately on warming. With concentrated sulphuric acid containing 1% potassium dichromate it gives a fine violet coloration in the cold; while with concentrated sulphuric acid containing sufficient potassium dichromate it gets carbonized and gives the odour of burnt sugar. With ferric chloride in aqueous or alcoholic solution it gives no coloration and reduces Tollen's reagent and

Fehling's solution only after hydrolysis with dilute mineral acids. With alcoholic caustic potash it does not give any coloration in the cold or on heating.

To a quantity of the substance (0.1 g.) in water (1 c.c.) 2 drops of 10% solution and α -naphthol in chloroform and 1 c.c. of con. H_2SO_4 were added when a reddish violet ring and on shaking a bluish violet precipitate was formed (Molisch's test). A small quantity of blepharin, dissolved in acetic anhydride gave on addition on a drop of concentrated sulphuric acid a pinkish violet coloration which deepened on standing (Liebermann's Cholesterol Reaction). To its solution glacial acetic acid, 1 c.c. of chloroform and a few drops of concentrated sulphuric acid were added when a permanent pink colour appeared (Hager-Salkowski reaction). It gave a negative Keller-Killiani reaction. (Found in sample dried at 120-125°: C, 48.94, 49.03; H, 5.39, 5.41%. M.Wt. of anhydrous blepharin in phenol (cryoscopically) 306, 330; $C_{16}H_{20}O_{11}$ requires M.Wt. 388; C, 49.5%; H, 5.16%.)

The ethyl acetate mother liquor which did not deposit any more crystals of blepharin and still had an intensely bitter taste was heated on the water bath in order to remove ethyl acetate and was dissolved in water with constant stirring and then precipitated with a solution of lead acetate. The resulting greyish yellow precipitate was filtered off, well washed first with hot water and then with alcohol and after decomposition with hydrogen sulphide in alcoholic suspension and filtration of the lead sulphide gave a reddish brown solution from which sulphuretted hydrogen was driven off by passing a current of carbon dioxide. On concentration under reduced pressure it deposited no crystalline mass. It was extracted with benzene which removed a trace of fatty matter and extractions with chloroform, ethyl acetate, acetone did not result in the isolation of any crystalline matter. The alcoholic solution on complete removal of the solvent left a dark brown sticky mass which

consisted mostly of catechol tannins and saponins, since on shaking it with water a large amount of foam resulted. It gave an intense blue coloration on addition of potassium ferricyanide containing a little ferric chloride, and a black coloration and then a precipitate with ferric chloride, a red coloration with concentrated sulphuric acid, reduced Tollen's reagents on warming, and mercuric chloride on long heating precipitated gelatine from solution and gave a greenish white precipitate with tartaremetic and a deep red coloration with potassium ferricyanide and ammonia.

The aqueous filtrate and washings from the aforementioned lead acetate precipitate gave a yellow precipitate on treatment with excess of basic lead acetate. This on being worked up in accordance with the method described above gave a brown alcoholic solution from which on concentration no precipitate separated.

The aqueous filtrate from the above basic lead precipitate was treated with hydrogen sulphide and the resulting lead sulphide filtered off. The light yellow filtrate was concentrated on the water bath to a small volume and was found to contain besides a large excess of glucose, and acetic acid a small amount of crystalline substance which has yet not been obtained in sufficient quantity. The mother liquor reduced Fehling's solution copiously and on treatment with phenyl-hydrazine an osazone was formed which was found to be identical with phenylglucosazone, m.p. 206° C., confirming thereby the presence of glucose in the solution.

The author wishes to convey his heartiest thanks to Dr. S. Dutt, D. Sc., P.R.S., for his keen interest in the work and to express his indebtedness to the "Kanta Prasad Research Trust" of the Allahabad University for a scholarship, which enabled him to undertake this investigation.

Further work on the elucidation of the constitution of blepharin and on oil is in progress.

CONSTITUTION OF THE COLOURING MATTER OF NYCTANTHES ARBORTRISTIS

“IDENTITY OF NYCTANTHIN WITH α -CROCETIN”

By JAGRAJ BEHARI LAL

Nyctanthes Arborescens Linn known as “*Harsinghar*” in Hindustani and as “*Shieuli*” in Bengali is a plant of the natural Order of Oleaceae. It is a large shrub with rough leaves and sweet-scented flowers occurring in the sub-Himalayan and Tarai tracts as well as in Central India, Burma, and Ceylon. The flowers open towards the evening and fall to the ground on the following morning. The corolla tubers are orange coloured and are well known to give a beautiful but fleeting dye which still finds limited application for dyeing silk in Northern India.

Hill and Sirkar (J.C.S., 1907, 91, 1501) examined these flowers and reported the isolation of a red crystalline colouring matter termed by them nyctanthin, which they isolated by repeatedly extracting with boiling alcohol the precipitate obtained by gently warming for several hours an aqueous decoction of the flowers with 1 per cent hydrochloric acid. The alcoholic extract on again heating with 1 per cent hydrochloric acid deposited the dye in red flocks which were finally crystallised from pyridine or phenylhydrazine. Nyctanthin separated from pyridine in minute regular hexagons and from phenyl-hydrazine in rhombic crystals which were yellow while wet and brick red when dry and according to Hill and Sirkar melted at $234-235^{\circ}$. With sulphuric acid it gave an intense blue colour, which rapidly turned yellow.

The analyses of nyctanthin by Hill and Sirkar agreed closely with $C_{20}H_{27}O_4$ or $C_{15}H_{20}O_3$ but of these formulae the

former was considered preferable, although it contained an odd number of hydrogen atoms. They also reported the isolation of a mono-acetyl derivative $C_{20} H_{26} O_4 Co CH_3$ but did not record its melting point.

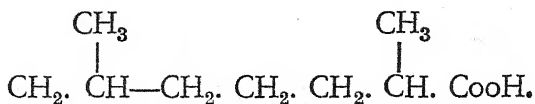
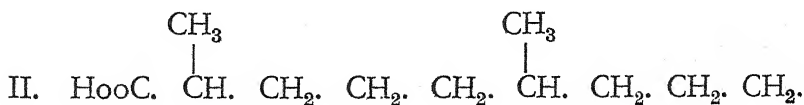
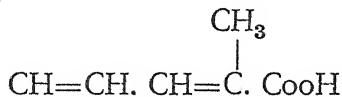
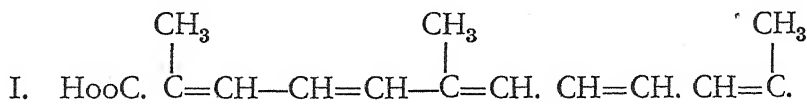
A. G. Perkin (J.C.S., 1912, 101, 1539) isolated in 0.1% yield from the flowers of 'Cedrela Toona' or the Indian Mahogany by acid hydrolysis of an aqueous extract of the flowers and subsequent crystallization from pyridine a red dye-stuff melting at $285-287^\circ$ (corr.) and giving with con. sulphuric acid a deep indigo-blue colour which however rapidly turned yellow. This compound was found to be identical with nyctanthin, the colouring matter of "Nyctanthes Arborescens" to which he reported that the previous workers had erroneously assigned the melting point $234-235^\circ$. A. G. Perkin came to the conclusion that nyctanthin is closely related to bixin, the colouring matter of Annatto, Bixin Orellana. His results indicated that the simplest formula for nyctanthin should be $C_{15} H_{18} O_3$ (Mean C=72.68%, H=7.7%).

"Among the numerous formulae then proposed for bixin that of Van Hasselt is $C_{29} H_{34} O_5$ and should this eventually prove to be correct then nyctanthin is possibly an oxy- or hydroxy-bixin $C_{29} H_{34} O_6$ (requiring C=72.8; H=7.71%)".

With a view to isolate the glucoside of nyctanthin, the possible existence of which is evident from the method of isolation followed by Hill and Sirkar and by A. G. Perkin and also to elucidate the structure of nyctanthin, the present investigation was undertaken. From the benzene extract of the dried flower stems 6.1% of a non-drying oil having R. D. at $20^\circ = 0.9178$, sap. value 178.5, acid value 3.14, and iodine value 96.32 and from the alcoholic extract 6.2—6.4% of d-mannitol melting at 166° have been isolated. The pure colouring matter was isolated by an elaborate method of purification described in the experimental part of the paper and melted at $272-273^\circ$ (uncorr.).

On analysis it gave results agreeing with the formula C_{20}

$H_{24}O_4$ which is the same as that of α -crocetin (R. Kuhn and F. L. Orsa, Ber., 1931, 64, (B), 1732, P. Karrer, et al., Helv. Chim. Acta, 1932, 15, 1399). The melting point of α -crocetin according to Karrer is $272-273^\circ$ (uncorr.) and $283-285^\circ$ (corr.), and it is interesting that the melting point of nyctanthin recorded by A. G. Perkin is $285-287^\circ$ (corr.). The melting point of nycanthin was found to remain undepressed by admixture with α -crocetin obtained through the kindness of Prof. P. Karrer. Thus the conclusion seems to be irresistible that nycanthin is identical with α -crocetin and exists free to the extent of about 0.1% in the flower stems although it is possible that it may be present as a glucoside which was hydrolysed by an enzyme during the course of collection of the flower stems. Nyctanthin obtained either by the method described in the experimental portion or by the method of Hill and Sircar (loc. cit.) is consequently $\alpha\epsilon\chi$ tetra methyl tetra-decaheptane $\alpha\zeta$ dicarboxylic acid (I) as this is the constitution assigned to α -crocetin by Karrer and his co-workers (Helv. Chim. Acta, 1932, 15, 1399; 1930, 13, 707; 1933, 16, 337) as the result of exhaustive degradation study of α -crocetin and its dimethyl ester as well is due to the remarkable synthesis of perhydro α -crocetin (II) (Helv. Chim. Acta, 1933, 16, 297).



Isolation of an amorphous colouring matter melting at 220° - 30° is also recorded.

Experimental

Dried flower stems free from white petals were obtained from Delhi and were coarsely powdered and extracted in 40g. lots in a Soxhlet's apparatus with various solvents. The solvent was subsequently evaporated and the extract thus obtained dried to a constant weight at 100° . The results are given below:—

Benzene Extract:— (6.12%). Light orange yellow oil.

Chloroform Extract:— (8.0%) Orange yellow fatty matter, sparingly soluble in boiling alcohol and greasy to touch.

Ethyl Acetate Extract (35.2%):—Orange red mass containing large amount of tinge silky white needles identified by crystallization from boiling alcohol to be d-mannitol. Contained reducing sugars.

Alcoholic Extract (1.2%):—Light orange in colour containing reducing sugars and a little mannitol.

Isolation of Mannitol:—For complete examination 4 kgs. of the coarsely powdered stems were in lots of 700 g. repeatedly extracted with benzene in a 5 litre extraction flask until no more oil was extracted. The combined orangish yellow extracts were distilled and the orangish yellow, fragrant, tasteless non-drying oil was collected. The oil free powder was successively extracted, with rectified spirit till the extracts were coloured only pale yellow. The orange yellow extracts were filtered hot and the combined extracts were distilled until most of the solvent had been recovered. It was then allowed to stand for a week by which time a large amount of white crystalline mass had separated. It was filtered at the pump and the residue washed with alcohol, until it had assumed a lemon yellow colour. After two crystallizations from boiling alcohol white glistening needles melting at 165 - 166° were obtained. The substance

was identified to be d-mannitol by its physical and chemical properties and also by its mixed melting point with Merck's pure mannitol which remained undepressed 165-166°. (Found C=39.40, H=7.65; $C_6H_{14}O_6$ requires C, 39.55% H, 7.69%). The hexa-acetate prepared by the action of acetic anhydride and sodium acetate on the substance melted at 119° which is also the melting point of d-mannitol hexa-acetate.

Isolation of Nyctanthin.—The alcoholic filtrate was concentrated first at ordinary pressure and finally under reduced pressure and was then extracted with benzene to remove oily and waxy matter. It was then extracted with ether, chloroform, ethyl-acetate and acetone in succession but from none of them any crystalline substance could be isolated. Therefore the whole of the coloured extract was dissolved in alcohol and treated with a slight excess of hot alcoholic lead acetate when first a pale yellow and finally an orange precipitate separated. The lead lake was filtered and well washed with hot alcohol and water. This on decomposition with pure sulphuretted hydrogen in alcoholic suspension and subsequent filtering off the lead sulphide gave a deep brownish yellow solution which on concentration deposited no crystalline stuff and gave with con. sulphuric acid a light indigo blue colour, which however rapidly turned brown and then yellow. It was insoluble in cold or hot benzene, chloroform, ethyl acetate, carbon tetra-chloride, ether and petroleum ether and was soluble in ethyl and methyl alcohol. On repeated extraction with benzene, chloroform and ethyl acetate no crystallisable substance could be isolated. The residue left after exhaustive extraction was a pale yellow amorphous mass giving a green colour with alcoholic ferric chloride and reduced Fehling's solution on heating and was evidently a tannin.

The alcoholic filtrate and washings from the precipitate with lead acetate was dissolved in distilled water and gave a bright yellow precipitate with excess of basic lead acetate. The precipitate was well washed with hot water and on decomposi-

tion with pure sulphuretted hydrogen in alcoholic suspension and after filtering off the lead sulphide gave an orange red solution which was kept overnight with dry lead carbonate in order to remove the excess of hydrogen sulphide. The filtered lead sulphide still retained a considerable quantity of the dye-stuff and after it had been dried in air at ordinary temperature was extracted several times with boiling alcohol and the filtrate concentrated and mixed with the main solution. The orange-red solution on concentration and cooling slowly deposited bright yellow crystalline mass which was filtered and washed at the pump and the filtrate on further concentration gave a little more of the dye-stuff. This dye-stuff after several crystallisations from boiling alcohol was obtained pure and after drying at 120° in air-oven melted at $272-273^{\circ}$ (uncorr.) and mixed with pure α -crocin melted at the same temperature. It is insoluble in water, benzene carbon-di-sulphide, ether, chloroform, carbon-tetrachloride and acetone and very soluble in pyridine. From the latter solvent it crystallised in glistening crystals which after washing with benzene in order to remove pyridine were dried in air oven at 120° and melted sharp at $272-273^{\circ}$ (uncorr.).

(Found C, 73.01, 72.98; H, 7.47, 7.39. $C_{20} H_{24} O_4$ requires C, 73.14; H, 7.34 per cent.)

Potassium Salt of Nyctanthin. Nyctanthin (.5 g.) was dissolved in the minimum amount of 1 per cent aqueous caustic potash and to the resulting solution 20 per cent caustic potash was gradually added till no further precipitation took place. It was filtered at the pump and well washed with cold alcohol and purified by crystallisation from hot ethyl alcohol when it separated as yellowish red nodular aggregates, readily soluble in water to deep yellow solution and sparingly soluble in cold alcohol. It was dried in the steam oven and analysed.

(Found C, 59.24; H, 5.56; K, 19.91. $C_{20} H_{22} O_4 K_2$ requires C, 59.37; H, 5.44; K, 19.34 per cent.)

Dimethyl ester of Nyctanther. To the ice cooled solution of nyctanthin (.3 g.) dissolved in absolute alcohol (200 c.c.) a solution of diazomethane in absolute ether obtained from 3 c.c. of nitroso methyl urethane was added in the course of half an hour. The mixture was then allowed to remain at room temperature for a few hours to allow the liberation of nitrogen to become complete. On concentrating the solution to a small volume dimethyl ester separated as red crystalline powder which after recrystallisation melted at $212-213^{\circ}$ C. (Found C, 73.82; H, 8.04. $C_{22}H_{28}O_4$ requires C, 74.12%; H, 7.92%.)

The alcoholic mother liquor gave on complete evaporation of the solvent a brownish yellow amorphous stuff which was successively extracted with carbon-di-sulphide, chloroform and finally with ethyl acetate, which removed the remaining trace of α -crocin which was still present. The residual stuff after drying in vacuum melted at 103° and dissolved in ammonium and alkali hydroxides and carbonates to deep yellow solutions, gave with con. sulphuric acid a deep blue colour which gradually turned violet, red and then brown, gave with alcoholic ferric chloride a deep brownish red colour and then a precipitate, with alcoholic lead acetate a brownish red precipitate, and reduced Fehling's solution only after hydrolysis. All attempts to crystallise it were unsuccessful.

(Found C, 52.18, 52.29; H, 6.34, 6.39. $C_{17}H_{24}O_{10}$ requires C, 52.6%, H, 6.2%. M, 388, $C_{20}H_{28}O_{12}$ requires C, 52.2%, H, 6.1%, M, 460.)

The aqueous filtrate and washings from the basic lead lake were freed from lead in the usual way and the resulting solution contained glucose in large amount besides mannitol, since it formed an osazone melting at 202° which was identified as phenyl glucosazone.

The author wishes to express his indebtedness to the Kanta Prasad Research Trust of the Allahabad University for a scholarship which enabled him to undertake this investigation and to

Dr. S. Dutt, D. Sc., P.R.S., for his keen interest in the work. The author wishes to convey his heartiest thanks and indebtedness to Prof. Dr. P. Karrer of Zurich University for a sample of α -crocetin and for valuable information.

PHOTONITRIFICATION AND THE INFLUENCE OF TEMPERATURE ON THE NITRATE FORMATION IN THE SOIL

By S. K. MUKERJI

Researches of Warington,¹ P. F. and J. C. Frankland² and Winogradsky in the methods of nitrate formation in the soil led to the view that the nitrate production in the soil from ammonium salts was entirely due to bacterial activity.

Recently Dhar³ and his collaborators mainly Gopala Rao⁴, Bhattacharya and Biswas⁵ have shown that the nitrate production in tropical countries of intense heat and sunlight is partly photochemical. They produced evidences of greater oxidisability of ammonium salts in solutions containing photocatalysts like zinc oxide, titania, silica etc., and in soils in shallow vessels.

These authors however have missed an important phenomenon in the course of their investigation. It is nitrogen-loss in the oxidation of ammonium salts. This is caused by the decomposition of an unstable intermediate compound ammonium nitrite which has been found to be the compound responsible for the loss of nitrogen from the soil. This aspect of the subject has been fully developed by me and Dhar in our recent publications.⁷

The loss of nitrogen in the process of photooxidation of ammonium salts makes this process a very complex one. It has

¹ J. Chem. Soc., 1878, 33, 44; 1879, 35, 429.

² Proc. Roy. Soc., 1890, 47, 286.

³ Ann. Inst. Pasteur, 1890, 4, 213, 257; 1891, 5, 922, 577.

⁴ Soil Sci., 1931, 31, 379.

⁵ J. Indian chem. Soc., 1933, 81.

⁶ Soil Sci., 1933, 35, 281.

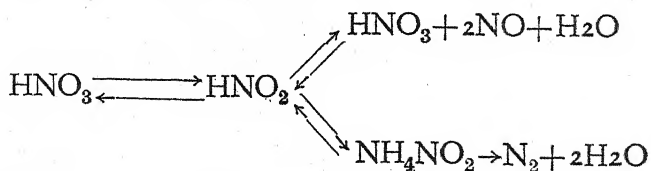
⁷ J. Indian Chem. Soc., 1935, 12, 67, 756; 1936, 13, 555.

been shown (loc. cit.) that the greater the velocity of oxidation of ammonium salts *i.e.* nitrification and higher the temperature, the more is the loss of nitrogen from the soil. In soil investigations where the effect of light is to be determined on the process of nitrification we must consider the following facts :

1. The velocity of the oxidation of the added salt may be so great that the exothermal decomposition of ammonium nitrite which increases with increasing concentrations of ammonium nitrite and high temperature may result to such a rapid loss of the added nitrogen that the amount of nitrogen to be converted into nitrate which cross this stage is very small.

2. The conditions of the system undergoing nitrification may at times be such that the concentration as well as the autocatalytic decomposition of ammonium nitrite is low, consequently the amount of nitrogen crossing the stage of the formation of ammonium nitrite is large and accumulation of nitrate takes place.

These facts must be considered whenever we analyse our experimental results for the effect of different agencies upon the nitrate formation in the soil. In aerable soils the velocity of oxidation of ammonium salts may be so great in light compared to that in dark that most of the added nitrogen is lost in the former and we observe more nitrate accumulation in covered plots in comparison to the plots receiving sunshine. It is well known that more intense the short wave radiations from the sun the greater is the amount of nitrite formed from nitrates. The nitrite can be lost either as ammonium nitrite finally into nitrogen gas or as nitrate and nitric oxide according to the equation



will go on in soil receiving sunshine. These factors often give

an erroneous aspect of the actual oxidation process to a superficial observer. It is evident that nitrification is not nitrate accumulation only but a combination of all these series of reactions. Accumulation of more nitrate in the soil does not give a true measure of nitrification for greater nitrification means more of ammonia oxidation and a consequent loss of total nitrogen from the soil. On the other hand the soil conditions may be such that the oxidation of ammonium salts proceed smoothly and the loss of nitrogen from the soil is low we should expect greater amount of nitrate in the soils exposed to sunlight than those kept in the dark. This has been clearly brought out in tables 1 (a) and 1 (b) (J. Indian Chem. Soc., 1936, 13, 556).

This explains why workers at some places supported Dhar's new theory of photonitrification and at others have disagreed with him. If the latter look up their values of ammoniacal, nitric and total nitrogen, even the worst opponent of the new theory will be convinced about the role of light in nitrification.

The following experiments were made to see whether any nitrate formation and nitrification take place under sterile condition in the soil. Accordingly quartz flasks were filled with weighed amounts of soil of known composition and plugged with cotton wool. The flask and the containers were sterilised in an autoclave at 20 lbs. pressure for four hours, sterile ammonium phosphate of known concentration was added and plugged again. These flasks were kept in the sun for definite periods and analysed. The following are the experimental results :

Exposure to sunlight in quartz containers from 4th May to 30th July, 1936.

	At the start	In 250 c.c. Quartz flask	In boiling tube
$\text{NH}_3\text{--N=}$	0.1023 gn.	0.0467 gn.	0.0389 gn.
$\text{NO}_3\text{--N=}$	0.0013	0.0020	0.0019
Total--N=	0.1463	0.1400	0.1424

percentage nitrate formed of the added

ammonium salt nitrified (a) In 250 c.c. Quartz flask=0.71%

(b) In Quartz boiling tube=0.60%

NH ₃ —N=	0.0523 gn.	0.0167 gn.	0.0134 gn.
NO ₃ —N=	0.0013	0.0017	0.0016
Total—N=	0.0963	0.0934	0.0941

percentage nitrate formed of the added

ammonium salt nitrified (a) In flask=0.72%

(b) In boiling tube=0.56%

The amount of oxidation of ammonium phosphate, seems to be very small and might be due to the compact in nature of the soil after sterilisation, which hindered the oxidation of ammonium phosphate.

Next, arrangements were made such, that pure and sterile air obtained by passing through a solution of FeSO₄, H₂SO₄ and concentrated sulphuric acid and distilled water was passed through two quartz flasks joined in series. Two catches containing dilute sulphuric acid was put at the end of each flask to catch the ammonia volatilised in the process of oxidation. Sterilisation of the flask, soil and solutions were made in an autoclave. The rubber tubings of the flask were plugged with cotton wool to avoid bacterial contamination. The following are the results.

These systems were exposed to sunlight from 13-1-37 to 8-2-37, exposure 150 hours.

1. NH ₃ —N=	0.0483%	2. NH ₃ —N=	0.0202%
NO ₃ —N=	0.0022	NO ₃ —N=	0.0022
Total—N=	0.0877	Total—N=	0.0597

Analysis after exposure to sunlight.

1. NH ₃ —N=	0.0208%	2. NH ₃ —N=	0.0076%
NO ₃ —N=	0.0025	NO ₃ —N=	0.0023
Total—N=	0.075	Total—N=	0.0573

In both cases the increase of nitrate is appreciable and due to greater oxidation in the first case the loss amounts to 0.0127% and in the second 0.0024%. These evidences, that nitrification may take place in the complete absence of bacteria, are in accordance with Prof Dhar's theory of photonitrification.

That the loss of nitrogen observed in this case is due to oxidation and not mainly due to the losses of ammonia by volatilisation. The analysis of the catches containing dilute sulphuric, which were placed in series adjacent to reaction vessels give the amount of nitrogen caught.

$\text{NH}_3\text{—N}$ in the catch of 1. = 0.0033%

$\text{NH}_3\text{—N}$ in the catch of 2. = 0.0014%

Whereas the amount of nitrogen lost in the process of oxidation are 0.0127% and 0.0024% respectively, which show the amount of nitrogen lost in the elementary form are 0.0093% and 0.0012% respectively. The higher the concentration of ammonium sulphate the greater is the loss of nitrogen.

Some workers have failed to detect greater nitrate accumulation in sunlight and others have observed greater nitrate formation in sunlight and have ascribed this due to higher temperature in the exposed vessels. Workers in the West have determined the optimum temperature for nitrate formation 25°, whereas Dhar and Tandon¹ have obtained results which show 35° as the more suitable temperature, for nitrate formation in the tropics. In view of the fact that the results obtained by these workers is strictly applicable to culture solutions only it is necessary to determine the effect of temperature in the soil, in the presence of joint microflora of the soil, which may be a nearer approximation to soil conditions.

Accordingly eight incubators were arranged at temperatures 20°, 25°, 30°, 35°, 40°, 45°, 50° and 60° respectively. Garden soil passing a 90 mesh sieve was weighed in 200 gm.

lots in flat enamelled dishes of 16 cm. diameter. To each of the dishes same amount of nitrogen as ammonium sulphate was added. A glass rod was kept in each basin to stir for maintaining aerable conditions. Water was added frequently to keep the mass moist. The temperature in the thermostate varied by $\pm 1^\circ$. The following are the experimental results obtained :

Experiment started on the 15th Sept., 1937; the original soil contained

$\text{NH}_3\text{—N} = 0.1408\%$

$\text{NO}_3\text{—N} = 0.0036\%$

Total—N = 0.1787%

Analysis on 30-9-37

Temperature	$\text{NH}_3\text{—N}$	$\text{NO}_3\text{—N}$	Total-N	pH
20°	0.08 %	0.0048%	0.1167%	
25°	0.0746	0.0052	0.1129	
30°	0.0468	0.008	0.1129	
35°	0.0508	0.0072	0.1078	
40°	0.0276	0.0058	0.0875	
45°	0.0248	0.0048	0.07	
50°	0.0164	0.004	0.0626	
60°	0.0092	0.0036	0.0612	

Analysis on 15-10-37

20°	0.04 %	0.0064	0.1012	7.4
25°	0.035	0.0162	0.0934	7.4
30°	0.0062	0.0372	0.0700	7.4
35°	0.008	0.028	0.0636	7.4
40°	0.0086	0.0224	0.0603	7.4
45°	0.0093	0.0063	0.0583	7.5
50°	0.0092	0.0042	0.0583	7.5
60°	0.0092	0.0036	0.0538	7.5

Analysis on 30-10-37

Temperature	NH ₃ —N	NO ₃ —N	Total-N	pH
20°	0.0224%	0.0188%	0.0964	7.4
25°	0.0198	0.0268	0.0912	7.4
30°	0.0042	0.0384	0.0688	7.2
35°	0.0042	0.0302	0.0612	7.2
40°	0.0042	0.0242	0.0575	7.4
45°	0.0042	0.0064	0.0512	7.4
50°	0.0036	0.0042	0.0487	7.4
60°	0.0032	0.0036	0.0488	7.5

These results indicate that the optimum temperature for nitrate accumulation in soil in the presence of the soil microflora is between 25°—30°, and not above this range of temperature, as have been observed by Dhar and Tandon in pure culture solution. Slight nitrate formation takes place at 50° but no nitrate formation was observed at 60°.

The results of those investigators who got more nitrate accumulation in sunlight have attributed this to temperature effect alone. They must scrutinise their results in view of the fact that optimum nitrification in the soil is observed at 30° and further we recede, the less nitrate formation is observed. From the researches of innumerable field investigation on nitrogen changes when nitrogenous matters are added to the soil, the author is convinced that the velocity of oxidation of ammonium salts in nitrification is markedly accelerated by sunlight and it is a very important problem so far economical agriculture is concerned.

Thanks are due to Prof. N. R. Dhar for his kind interest in this work.

DENITRIFICATION IN SUNLIGHT AND ITS RETARDATION—PART IV

By S. K. MUKERJI

In recent communications Dhar and myself (J. Indian Chem. Soc., 1935, 12, 67, 756; 1936, 13, 555) have shown that when ammonium salt is added to the soil, there is marked losses of nitrogen in the elementary form. This loss was attributed to the formation and decomposition of ammonium nitrite. This view explains the observations of many workers in India and abroad that "nitrate formation is attended with nitrogen loss from soil." The observation of Dhar and collaborators that the oxidation of ammonia in soil is partly a photochemical process apart from the well-known bacterial one and myself that ammonium nitrite decomposition is exothermal and photosensitive, have led to the postulation of greater loss of nitrogen in sunlight. Extensive field and basin investigations (loc. cit.) show that it generally holds true.

Another important point has been brought out in these papers about the principles, by which this type of nitrogen loss can be checked. The theory of negative catalyst as first explained by Dhar in the retardation of many chemical reactions by traces of another reagent has found a general application in the retardation of this type of nitrogen loss. The studies in the previous papers mainly relate the loss with ammonium salts and its retardation by carbohydrates.

"No loss of nitrogen has been observed in the straightforward bacterial oxidation of organic substances" (Russell, Soil Conditions and Plant Growth, 1932, pp. 367-69). This article records observations in the nitrogen changes in the soil

on the application of Urea, blood and gelatin, and the effect of carbohydrate upon their oxidation in the soil. Plots of 4 feet square were selected in the middle of the field. Two rows of such plots were chosen. One row was kept exposed to the sun and the other row receiving similar treatment as one opposite to the first row was covered with wooden planks to cut off sunlight. The wooden planks were kept about 2 inches above the ground by mud bund to allow aeration. Digging of these plots were done once in a fortnight in evenings. No watering of these plots were done and heavy shower was recorded only once on 1-5-37 in the course of these experiments. Rainy weather prevailed after 20th July and the last analysis is after some washing of the fields by rain. The following are the experimental results :

Blood				
Exposed				
NH ₃ —N	NO ₃ —N	Total—N	Total—e	Date of Sampling
0.001 %	0.0028%	0.07 %	0.5424%	27-11-36
0.0012	0.0031	0.07	0.5133	7-12-36
0.0025	0.0037	0.07	0.4569	25-12-36
0.0026	0.0042	0.07	0.4562	25-1-37
0.0096	0.008	0.0636	0.4421	25-2-37
0.0011	0.0112	0.05	0.4412	22-3-37
0.0011	0.011	0.0482	0.4421	3-5-37
0.0011	0.0022	0.0412	0.4248	3-8-37
Covered				
0.001 %	0.0032%	0.0823%	0.5569%	27-11-36
0.0012	0.0034	0.0823	0.5234	7-12-36
0.0022	0.0036	0.0799	0.4932	25-12-36
0.0022	0.0038	0.0799	0.4884	25-1-37
0.0014	0.0073	0.0636	0.4646	25-2-37
0.0014	0.008	0.0584	0.4412	22-3-37
0.0014	0.0082	0.0578	0.4612	3-5-37
0.0017	0.0136	0.0512	0.4444	3-8-37

Blood+27 K. G. molasses

Exposed

NH ₃ —N	NO ₃ —N	Total—N	Total—e	Date of Sampling
0.0030%	0.0031%	0.0934%	2.829 %	27-11-36
0.0029	0.0031	0.0934	2.539	7-12-36
0.0037	0.0032	0.0934	2.182	25-12-36
0.0043	0.0035	0.0941	1.121	25-1-37
0.0031	0.0021	0.0931	0.862	25-2-37
0.0028	0.0035	0.0778	0.845	23-3-37
0.0028	0.0036	0.0712	0.8214	3-5-37
0.0015	0.0022	0.0584	0.5368	3-8-37

Covered

0.0028%	0.0031	0.0875%	2.781 %	30-11-36
0.0021	0.0025	0.0875	2.631	7-12-36
0.0036	0.0023	0.0874	2.010	25-12-36
0.0056	0.0018	0.0872	0.9921	25-1-37
0.0018	0.0014	0.0824	0.7212	25-2-37
0.0029	0.0031	0.0824	0.7224	22-3-37
0.0029	0.0031	0.0823	0.7112	3-5-37
0.0042	0.0079	0.0754	0.6122	3-8-37

Urea 715 grams

Exposed

0.0031%	0.0023%	0.14 %	0.385 %	7-12-36
0.020	0.0031	0.14	0.3886	25-12-36
0.02	0.005	0.1271	0.3892	25-1-37
0.0154	0.0086	0.1178	0.3892	25-2-37
0.0035	0.028	0.0875	0.3912	22-3-37
0.0036	0.0308	0.071	0.3921	3-5-37
0.0008	0.0037	0.0458	0.3921	3-8-37

Covered

0.004 %	0.0022%	0.175 %	0.385 %	7-12-36
0.014	0.0025	0.175	0.3886	25-12-37
0.015	0.0039	0.1654	0.3892	25-1-37
0.0174	0.0070	0.1524	0.3892	25-2-37
0.0014	0.025	0.1004	0.3892	22-3-37
0.0016	0.0264	0.0998	0.3892	3-5-37
0.0019	0.0288	0.0864	0.3892	3-8-37

Urea 715 gms. + 26½ K. G. molasses

Exposed

NH ₃ —N	NO ₃ —N	Total—N	Total—e	Date of Sampling
0.005 %	0.0022%	0.200	2.533	7-12-36
0.0056	0.0040	0.1986	2.077	25-12-37
0.0062	0.0043	0.1925	0.994	25-1-37
0.0031	0.0044	0.1612	0.8132	25-2-37
0.0031	0.0056	0.1277	0.8043	22-3-37
0.0037	0.0054	0.1182	0.8112	3-5-37
0.0096	0.0038	0.0612	0.5482	3-8-37

Covered

0.0049%	0.0035%	0.200 %	3.431 %	7-12-36
0.0043	0.0028	0.1892	1.583	25-12-36
0.0061	0.0037	0.1874	0.8454	25-1-37
0.0043	0.0039	0.1721	0.7944	25-2-37
0.0035	0.004	0.1346	0.7934	22-3-37
0.0037	0.0054	0.1212	0.7118	3-5-37
0.0019	0.0288	0.0986	0.5324	3-8-37

Gelatin

Exposed

0.02%	0.0056%	0.200 %	0.7198%	25-12-36
0.04	0.0062	0.200	0.7112	25-1-37
0.046	0.0074	0.1752	0.7086	25-2-37
0.035	0.007	0.1556	0.6012	22-3-37
0.014	0.0104	0.1042	0.6012	3-5-37
0.0017	0.0044	0.0487	0.4986	3-8-37

Covered

0.02%	0.0056%	0.212 %	0.7198%	25-12-36
0.037	0.0058	0.200	0.7154	25-1-37
0.038	0.0063	0.1823	0.7092	25-2-37
0.017	0.0075	0.1667	0.6124	22-3-37
0.0178	0.0079	0.1508	0.6124	3-5-37
0.0018	0.0082	0.1008	0.5132	3-8-37

Gelatin + 26½ K. G. molasses

Exposed				
NH ₃ —N	NO ₃ —N	Total—N	Total—e	Date of Sampling
0.02%	0.0062%	0.200 %	1.838%	25-12-36
0.0056	0.0066	0.200	0.9842	25-1-37
0.018	0.0047	0.1924	0.8218	25-2-37
0.0056	0.008	0.175	0.8138	22-3-37
0.0062	0.0084	0.1731	0.8034	3-5-37
0.001	0.0062	0.0512	0.5134	3-8-37
Covered				
0.0200%	0.008%	0.200 %	1.838%	25-12-36
0.007	0.0057	0.200	0.9672	25-1-37
0.0106	0.0039	0.1864	0.8122	25-2-37
0.005	0.028	0.1750	0.8112	22-3-37
0.0056	0.030	0.1734	0.8112	3-5-37
0.0017	0.0082	0.1338	0.5234	3-8-37

These results show that urea and proteins while undergoing oxidation in soil into ammonia and then to nitrate, nitrogen is lost in the gaseous form. This type of loss of nitrogen cannot be explained from bacterial viewpoint, for in the bacterial oxidation of proteins nitrogen is not lost in gaseous form. Therefore this type of nitrogen loss from soil is mainly chemical. Also the loss of nitrogen is higher in plots exposed to the sun in comparison to covered plots. This shows that light increases the velocity of ammonification and nitrification and the consequent formation of ammonium nitrate, which decomposes exothermally giving gaseous nitrogen.

It is well known that the soil nitrogen cannot be increased alone without a corresponding increase of its carbon content. This leads to the interesting conclusion that in presence of carbonaceous matter, the soil nitrogen is protected, for the carbonaceous matter acts as a negative catalyst and retards the process of nitrification which is an oxidation reaction. Unless nitrification takes place and nitrite ion is formed in place of ammonium ion, the formation and decomposition of ammonium nitrite is not

possible. Hence in presence of large amounts of carbonaceous matter, this type of nitrogen loss will not be pronounced. The experimental results show that addition of molasses markedly decrease nitrate formation and loss of nitrogen from soils. On the other hand in the absence of carbonaceous substances, the soil nitrogenous matter will undergo oxidation more readily with the formation of ammonium nitrite, which is liable to be partially decomposed in the soil with the consequent loss of nitrogen.

In several publications from the laboratory (cf. Dhar, "New Conceptions in Bio-chemistry," 1932, pp. 44-45) it has been shown that both carbohydrates and fats markedly act as negative catalysts and retard the oxidation of amino-acids, and proteins and that is why carbonaceous substances and fats act as a protein sparer in the animal body. Similarly in the soil, carbonaceous substances like cellulose, carbohydrates, fats etc. added with organic manures retard the oxidation of proteins, amino-acids and ammonium salts by air and thus act as a protector of soil nitrogen compounds. It is clear, therefore, when the carbon content of a soil is high and nitrogen low, there will be less oxidation of the soil nitrogen and less chance for the formation and decomposition of ammonium nitrite and less nitrogen loss than when the carbon content is low and nitrogen content high. The foregoing observations justify the application of organic manures for preserving the nitrogen in soils, specially in tropical countries, where due to sunlight and high temperature, the velocity of oxidation of soil organic and inorganic compound is high and the nitrogenous compounds need more protection than in temperate climates.

Thanks are due to Prof. N. R. Dhar for his kind interest in this work.

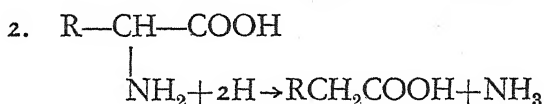
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Allahabad University.

PHOTO AMMONIFICATION IS AN OXIDATION PROCESS IN SOIL

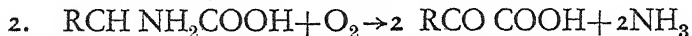
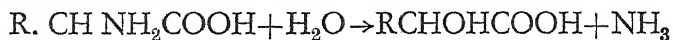
By S. K. MUKERJI

Recently Dhar (Proc. Soc. biol. chem. India, 1935, chapter 1, p. 8) has pointed out that deamination of amino-acids can be effected by light and whether in soil or in human system the process is an oxidative one.

The first step in the conversion of an amino-acid into glucose or fat is the removal of the amino group. The animal body possesses only a limited capacity for the oxidation of nitrogen, confined apparently to the oxidation of nitrite to nitrate. (Mitchell, J. Biol. Chem., 1916, 461). Hence the purpose of deamination may be considered as the removal of an unoxidisable fragment of our food proteins. While it is possible to conceive of deamination as a reduction of the type



In all probability, it occurs in the animal body or in soil as a result of either hydrolysis or oxidation.



of these two probable methods of deamination the oxidative deamination has been favoured by some and the other the hydrolysis. Dakin (Oxidation Reduction in Animal Body, 1922, pp. 64-71) has summarised facts in favour of oxidative deaminations based upon indirect evidences. Knoop and Kertters (Z. Physiol. Chem., 1911, 71, 252), Suwa (ibid., 1922, 122, 211). Kotak, Massi and Morri (ibid., 1922, 122, 211), Ringer (J. Biol.

Chem., 1913, 15, 145) and others are in favour of formation of hydroxy acids. However Alderhalden (*Lehrbuch der physiologischen Chemie*, Auflage I, Teil Ber., 1923) argues that no general statement can be made as to the method of formation of amino-acids.

The conclusions arrived at by some of the above experimenters cannot be regarded as conclusive, for hydroxy acids may be a reduction product of Ketonic acids. In view of the fact that the above workers had to depend upon the factors upon which they had no control, much controversy has arisen in this most interesting biological problem, "the fate of amino-acids in general catabolism." Again it may be pointed out that the relations between amino, hydroxy and ketonic acids are extremely close and their inter-action whatever may be is readily reversible.

It is clear from the above viewpoint that the experiments conducted in detections of ketonic acids in the products of catabolism is futile and the results so obtained must be necessarily inconclusive.

This investigation is the natural physico-chemical tendency of amino-acids which must be the obvious fate that amino-acids and consequently the proteins must meet either due to enzymes or other factors. To this effect, I have made solutions of amino-acids to a known strength and exposed them in beakers to sunlight in presence or absence of catalysts. Two sets were made. Through one set, a slow stream of air was passed and the other set was kept as such. Sufficient mercuriciodide was added as an antiseptic. The rate of decomposition was followed by measuring the amount of ammonia formed by the Folin's method. My immediate object is to see the rate of evolution of Ammonia under different circumstances and for this purpose an exact knowledge of the amount of nitrite formed is not essential. So I did not measure the amount of

nitrite formed in these cases. The following are the experimental results :

Aspartic acid

Temp. = 40-45°C. ; 0.5 gm. dissolved in 100 c.c.

pH of the solution = 2.214.

$k_a = 1.5 \times 10^4$ (Hopfield, Science, 1920, p. 614).

Time of exposure	20 hrs.	40 hrs.	70 hrs. covering 53 days	Dark after 53 days
With no photo-catalyst	0.0002 gm. NH ₃ per litre	0.0008 gm.	0.0286 gm.	0.0006 gm.
With 5gms. TiO ₂	0.011	0.0288	0.1445	0.0009
With 5gms. ZnO	0.0008	0.0013	0.0495	0.0006
With 5 gms. SiO ₂	0.0013	0.0017	0.0201	0.0006

Temp. 35°C.

Time of exposure	20 hrs.	30 hrs.	40 hrs.
Without air	0.0003 gm.	0.0004	0.0009 gm. NH ₃ per litre
With air	0.0004	0.0004	0.0011

With 5 gm. titania

Without air	0.0283	0.051	0.1129
With air	0.0340	0.0637	0.1824

Glutamic acid

Temp. 40-45°C.; 0.5 gm. dissolved in 100 c.c.

pH of the exposed solution = 3.66.

$K_a = 6.3 \times 10^{-5}$ (Z. physiol. Chem., 1908, p. 738)

Time of exposure	20 hrs.	40 hrs.	70 hrs. covering 53 days	Dark after 53 days
Without any photocatalyst	0.0003 gm.	0.0006 gm.	0.0017 gm.	0.0007 gm.
With 5 gms. TiO_2	0.0085	0.0238	0.2235	0.0017
With 5 gms. ZnO	0.0005	0.0013	0.034	0.0008
With 5 gms. SiO_2	0.0004	0.0018	0.017	0.0008

Temp. maximum 35°

Time of exposure	20 hrs.	30 hrs.	40 hrs.
Without air	0.0003	0.0004	0.0004
With air	0.0003	0.0004	0.0005

With 5 gms. titania

Without air	0.002	0.0032	0.004
With air	0.0035	0.0042	0.0062

It is evident from the foregoing results that the process of oxidation is an oxidative one. The exposed beakers as such dissolve sufficient amounts of atmospheric oxygen which oxidises amino acids. The other set through which a slow stream of air is passed to keep the solutions saturated with oxygen, in each case exhibits a greater percentage of oxidation. Thus comparing after 20 hours exposure to sunlight:

	Alone	On passing air	Amount more oxidised
Aspartic acid	0.062 %	0.064 %	0.002 %
Glutamic acid	0.0593	0.0627	0.0034

With surface of 5 gms. TiO_2

Aspartic acid	4.43 %	5.32 %	0.89 %
Glutamic acid	0.349	0.441	0.092

It seems that the oxidation of proteins is a process of oxidation. This also occurs in soil is clear from the following experiments:

0.5 gm. glutamic acid in 100 c.c. distilled water

Time of exposure	20 hrs.	30 hrs.	40 hrs.
5 gms. Sterile Soil + 1 gm. HgI_2	0.0004	0.0009	0.0026 gm. NH_3
Above and aeration	0.0008	0.0018	0.0037

These experiments show a greater oxidation in sunlight and in passing air. Also photocatalysts markedly enhance ammonification. Thus in the case of aspartic acid, titania accelerates the photo-oxidation by 45.3%, Zinc oxide by 2.06% and silica by 0.265%. How surface acts in these reactions is not exactly understood, however, Baur and Neuweiler (Helv. Chem. Acta, 1927, 10, 901) have shown by exposing aqueous suspensions of photocatalysts in contact with air and sunlight; hydrogen peroxide is formed. If this be the case, then why surface increases photo-oxidation is obvious. The amino-acids get absorbed on the surface of photocatalysts and get oxidised at the expense of hydrogen peroxide so formed. Naturally, the higher the capacity of photocatalysts to absorb oxygen and produce hydrogen peroxide the higher should be its capacity for accelerating photo-oxidation.

Acceleration of deamination by photocatalysts is in favour of the photochemical view and shows that the ammonification

of soils is a photo-chemical process along with the well-known bacterial process. The fact remains to be established whether ammonification can take place under sterile conditions. To investigate this point ordinary glass 300 c.c. flasks were taken. Amino-acid solutions and 25 gms. of soil were placed in each. The soil, the containers, and the amino-acid solution all were sterile and after mixture plugged with cotton wool and sterilised finally and exposed to sunlight. After the exposure ammonia and nitrate were determined by "Folin's" method and subsequent reduction by "Devardas" method of nitrates and distilling again. The flasks after exposure were tested by plate method for sterilisation and found sterile. The following are the results of only such flasks where no colony was seen to grow on plates :

Exposure=349 hours. From 7-2-35 to 2-4-35.

Tyrosine
added=0.01546 gm.
nitrogen

$$\left\{ \begin{array}{l} \text{NH}_3\text{-N} = 0.00099 \text{ in 25 g. soil used} \\ \text{NO}_3\text{-N} = 0.0007 \text{ " " " } \\ \hline 0.001698 \\ 0.001053 \text{ nitrogen in the soil} \\ \hline 0.00064 \\ 4.1 \% \text{ nitrogen ammonified} \end{array} \right.$$

Alanine
added=0.03146 gm.
nitrogen

$$\left\{ \begin{array}{l} \text{NH}_3\text{-N} = 0.0034 \text{ in 25 g. soil used} \\ \text{NO}_3\text{-N} = 0.000465 \text{ " " " } \\ \hline 0.003865 \\ 0.001053 \\ \hline 0.00281 \\ 8.9 \% \text{ nitrogen ammonified} \end{array} \right.$$

Glutamic acid
added=0.01918 gm.
nitrogen

$$\left\{ \begin{array}{l} \text{NH}_3\text{-N} = 0.0022 \text{ in 25 g. soil used} \\ \text{NO}_3\text{-N} = 0.00067 \text{ " " " } \\ \hline 0.00287 \\ 0.00105 \\ \hline 0.00182 \\ 9.4 \% \text{ nitrogen ammonified} \end{array} \right.$$

Leucine
added=0.02137 gm.
nitrogen

$$\left\{ \begin{array}{l} \text{NH}_3\text{--N} = 0.00159 \text{ in 25 g. soil used} \\ \text{NO}_3\text{--N} = 0.000467 \\ \hline 0.002037 \\ 0.001053 \\ \hline 0.001004 \end{array} \right.$$

4.6% nitrogen ammonified

Valine
added=0.02393 gm.
nitrogen

$$\left\{ \begin{array}{l} \text{NH}_3\text{--N} = 0.0010 \text{ gm. in 25 g. of the soil} \\ \text{NO}_3\text{--N} = 0.00044 \\ \hline 0.00144 \\ 0.001053 \\ \hline 0.000397 \end{array} \right.$$

1.2% nitrogen ammonified

The foregoing results show that deamination takes place in completely sterilised conditions in visible light. In some experiments especially with tyrosine and glutamic acid, considerable nitrate formation has taken place. The amount of ammonia formed seems to be independent of the amount of nitrogen introduced and depend on the nature of the amino-acid used. Glutamic acid seems to be more easily deaminised.

These findings substantiate Dhar's hypothesis of photo-ammonification in sunlight. In these experiments glass vessels were used and naturally they cut off most of the ultraviolet light so quartz vessels were used to determine the effect of sunlight on ammonification. Alanine was chosen for this purpose. 50 gms. soils in quartz flasks and boiling tubes were sterilised in an autoclave at 20 lbs. pressure for about 4 hours. Then the alanine solution was added, plugged with cotton wool and sterilised again for 15 minutes. Plating showed that this procedure completely freed the system from bacteria. The vessels containing amino-acid were then exposed to sunlight: the following are the experimental results :

Exposure to sunlight in quartz vessels from 4th May to 30th July, 1936.

At the start	In 250 c.c. flask	In boiling tube
$\text{NH}_3\text{—N} = 0.00233 \text{ gm.}$	0.0175 gm.	0.0261 gm.
$\text{NO}_3\text{—N} = 0.00134$	0.00158	0.00167
Total—N = 0.1463	0.128	0.131

percentage nitrogen ammonified : 15.17% in flasks

23.77% in tube

percentage nitrate nitrogen produced : 0.24% in flask

0.33% in boiling tube

At the start	In quartz flask	In boiling tube
$\text{NH}_3\text{—N} = 0.00233 \text{ gm.}$	0.0167 gm.	0.00921 gm.
$\text{NO}_3\text{—N} = 0.00134$	0.00194	0.00158
Total—N = 0.0963	0.0934	0.0941

percentage nitrogen ammonified : 26.7% in flask

13.7% in boiling tube

percentage nitrogen nitrate produced : 0.12% in flask

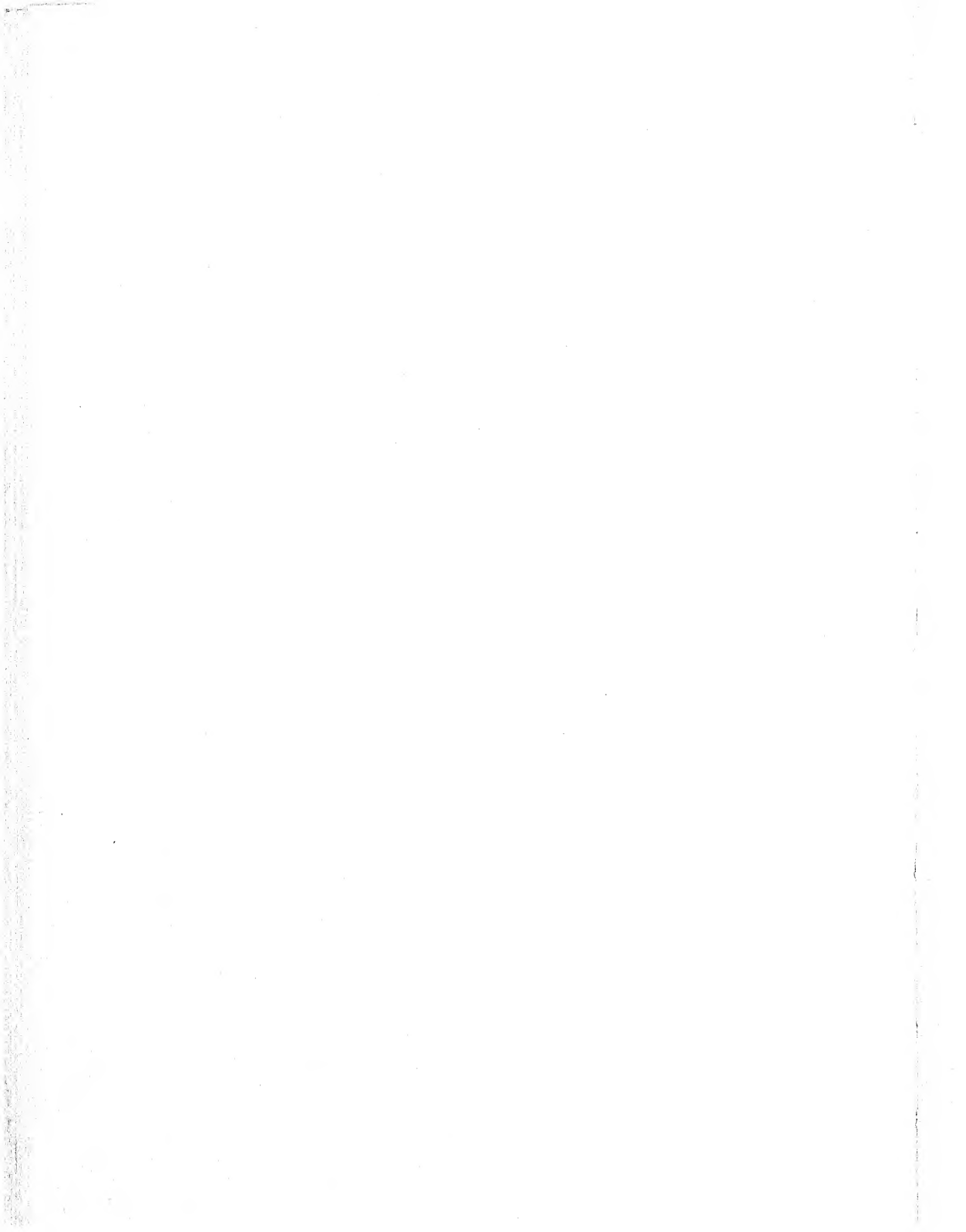
0.048% in boiling tube

These results indicate that the ammonification can take place under completely sterile conditions in soil and this process is considerably accelerated by sunlight. Greater ammonification takes place at shorter wave-lengths. Nitrate formation is also appreciable. Further experiments are in progress to investigate this problem more fully.

Thanks are due to Professor Dhar for his kind interest, and valuable suggestions in this work.

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SECTION II
BOTANY



FLORA OF ALLAHABAD

PART I

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People have often felt the need of local floras of smaller areas for the use of students both in the class-room and outside in the fields. Here an attempt has been made to make as complete a list as possible of the flowering plants, excepting grasses, found growing wild, or cultivated in the fields, or grown as ornamental plants in the gardens, in and round about Allahabad, in the hope that it will be useful to post-graduate students and others interested in floras.

The plants were collected from various localities during the different seasons and identified by the author.

Brief descriptions of the genera and species are given and vernacular names are mentioned in those cases where they are in common use. The garden plants are mentioned under the families to which they belong, and are marked with an asterisk.

The following references have been frequently consulted.

- | | | | | | |
|----------------|---|---|---|---|--|
| Brandis, D. | - | - | - | - | Indian Trees. |
| Duthie, J. F. | - | - | - | - | Flora of the Upper Gangetic Plain and
of the adjacent Siwalik and Sub-Himalayan Tracts. |
| Haines, H. H. | - | - | - | - | The Botany of Bihar and Orissa. |
| Hooker, J. D. | - | - | - | - | Flora of British India. |
| Kanji Lal | - | - | - | - | Forest Flora for Pilibhit, Oudh, Gorakhpur and Bundelkhand. |
| Kashyap, S. R. | - | - | - | - | Lahore District Flora. |
| Parker, R. N. | - | - | - | - | A forest Flora of the Punjab, Hazara and Delhi. |

I. RANUNCULACEAE

Ranunculus, *Linn.*

Erect annual, found chiefly on wet ground. Flowers small, yellow. Petals five, glandular near the base. Stamens and carpels many spirally arranged on an elongated axis (thalamus).

Ranunculus sceleratus, *Linn. Fl. Brit. Ind. I, p. 19.* Vern. *Jaldhaniya*.

Achenes turgid.

Flowers: February-March.

Ranunculus pensylvanicus, *Linn. Fl. Brit. Ind. I, p. 19.*

Achenes flattened.

Flowers: February-March.

***Clematis** sp., *Fl. Brit. Ind. I, p. 2.*

A petiole-climber with pinnate leaves. Flowers in dense pannicles, white. Achenes oblong, hairy.

Flowers during the rainy season.

***Nigella sativa**, *Linn. Vern. Kalajira. Duthie. Fl., Vol. I, p. 17.*

A small herb with pinnatisect leaves. Flowers solitary on long peduncles, pale-blue. Ovary partially syncarpous. Fruit capsule with persistent stigmas.

Flowers: February-March.

***Delphinium** sp. (Larkspur), *Fl. Brit. Ind. I, p. 27.*

A garden plant, herbaceous, with zygomorphic flowers.

Flowers during the winter season.

II. MAGNOLIACEAE

***Michelia champaca**, *Linn. Fl. Brit. Ind. I, p. 42.* Vern. *Champa*.

A tall evergreen tree with sweet-scented yellow flowers.

Flowers: March-June.

III. ANONACEAE.

**Anona squamosa*, *Linn. Fl. Brit. Ind. I, p. 78.* Vern. *Sharifa*.
(Custard-apple).

A shrub or small tree. Leaves 2-5" long, oblong, lanceolate. Flowers greenish-yellow, drooping. Sepals 3, minute. Outer petals tapering, inner minute. Fruit a cluster of berries.

Flowers: May-July.

**Polyalthia longifolia*, *Benth. Fl. Brit. Ind. I, p. 62.* Vern. *Ashok*.

A handsome evergreen tree with lanceolate, acuminate, shining, undulate leaves.

Flowers: March-April.

IV. MENISPERMACEAE

Tinospora cordifolia, *Miers. Fl. Brit. Ind. I, p. 97.* Vern. *Guloh*.

A climbing succulent shrub with aerial roots. Flowers small, yellow, unisexual. Sepals 6, 2-seriate. Petals 6, smaller. Stamens 6, in male flowers; staminodes 6, in female flowers. Carpels 3. Fruit a drupe. Seeds ovoid or reniform.

Flowers during the rainy season.

Cocculus villosus, *DC. Fl. Brit. Ind. I, p. 101.* Vern. *Hier*.

A climbing undershrub. Leaves 2-3" long, petiolate, 3-lobed. Flowers unisexual. Carpels 3-6. Seeds horse-shaped or hooked.

Flowers: September-November.

Cissampelos pariera, *Linn. Fl. Brit. Ind. I, p. 104.*

A twining shrub. Leaves peltate, orbicular. Flowers unisexual. Sepals of male flowers 4, of female 2, Cappel solitary.

Flowers during the rainy season.

V. NYMPHAEACEAE

Nymphaea, *Linn.*

Large aquatic herbs. Leaves and flowers floating. Flowers on long scapes with petals in many series. Anthers small, linear. Carpels many in one series, sunk in the fleshy disc; ovules many. Fruit a spongy berry, ripening under water.

Nymphaea lotus, *Linn. Fl. Brit. Ind. I, p. 114.* Vern. *Chota Kamval*, *Nilofar* (Indian Lotus).

Leaves sharply toothed. Anthers without appendages.

Flowers during the rainy season.

Nelumbium speciosum, *Willd. Fl. Brit. Ind. I, p. 116.* Vern. *Kamval* (Sacred Lotus).

Leaves and flowers above water. Flowers 4-10" in diameter, pink or white.

Flowers during the hot season.

VI. PAPAVERACEAE

Papaver, *Linn.*

Annual with milky or coloured juice. Flowers on long peduncles, markedly nodding in the bud. Capsules opening by valves under the lobes of the persistent stigmas.

***Papaver somniferum**, *Linn. Fl. Brit. Ind. I, p. 117.* Vern. *Post* (Opium poppy).

Large white flowers.

Cultivated in fields during the winter season.

***Papaver rhoeas**, *Linn. Fl. Brit. Ind. I, p. 117.* (Garden Poppy).
Large scarlet red flowers.

Argemone mexicana, *Linn. Fl. Brit. Ind. I, p. 117.* Vern. *Kateri*.

Erect herb with yellow juice. Leaves with spiny teeth. Flowers yellow. Fruit a capsule, prickly, dehiscing by valves.

Flowers: January-April.

VII. FUMARIACEAE

Fumaria parviflora, *Lamk. Fl. Brit. Ind. I, p. 128.* (Fumitory).

A much branched herb. Leaf-opposed racemes with zygomorphic, pink flowers and globose fruits.

Flowers: February-April.

VIII. CRUCIFERAE

Brassica, *Linn. Fl. Brit. Ind. I, p. 155.*

Annual, biennial or perennial herbs. Lower leaves lyrate, upper often entire. Flowers in corymbs, yellow, with cruci-form corolla. Fruit long siliqua.

No species of this genus is truly wild within the area
but are cultivated during the winter season.

***Brassica campestris**, *Linn. Var. Sarson.* Vern. *Sarson*.

***Brassica juncea**, *Hk. f. and T.* Vern. *Rai*.

***Brassica napus**, *Linn.* Vern. *Kali sarson*.

Eruca sativa, *Tourn. Fl. Brit. Ind. I, p. 158.* Vern. *Duan.*

Like Brassica plants but yellow flowers with purple veins on the petals.

Flowers: January-February.

Senebiera pinnatifida, *DC. S. didyma, Pers. Dutchie. Fl., Vol. I, p. 47.*

Annual with much divided leaves and spreading from the very base of the stem. Flowers small apetalous. Pod small $1/12$ " broad, 1-seeded.

Flowers: December-June.

***Raphanus sativus**, *Linn. Fl. Brit. Ind. I, p. 166.* Vern. *Muli.* (Radish).

Root fleshy, variable in size and form. Flowers white or lilac with purple veins. Pods terete.

Flowers during the cold weather.

Cochlearia flava, *Buch-Ham. Fl. Brit. Ind. I, p. 145.*

An erect diffused branched annual. Flowers small yellow. Pods globose smooth.

Flowers: January-March.

Capsella bursa-pastoris, *Moench. Fl. Brit. Ind. I, p. 159.* (Shepherd's Purse).

Much branched annual. Radical leaves, pinnatifid, upperlobes triangular. Flowers $1/10$ " in diameter, white. Pod $1/4$ "- $1/3$ " long, many seeded, compressed laterally (at right angles to the septum).

A common weed of cultivation during the cold season.

***Lepidium sativum**, *Linn. Fl. Brit. Ind. I, p. 159.* Vern. *Halim.*

Erect or diffuse herbs. Flowers small, white. Pods small, few seeded, compressed laterally.

Cultivated in the plains as a cold-weather garden crop.

- **Mathiola* (Stock) Yellow flowers. *Duthie. Fl., Vol. I, p. 38.*
- **Cheiranthus cheiri* (Wall-flower). White flowers. *Duthie. Fl., Vol. I, p. 38.*
- **Iberis contracta* (Candy-tuft). White flowers. *Duthie. Fl., Vol. I, p. 38.*

IX. CAPPARIDEAE

Cleome viscosa, *Linn. Fl. Brit. Ind. I, p. 170.*

An erect glandular-pubescent annual, 1-3 ft. high. Leaves 3-5 foliate. Sepals 4. Petals 4, yellow. Ovules many on two parietal placentas. Capsule oblong-linear.

Flowers during the rainy season.

Gynandropsis pentaphylla, *DC. Fl. Brit. Ind. I, p. 171.* Vern. *Hulbul.*

An erect annual. Leaves 3-7 foliate. Petals 4, purple. Stamens 6, filaments adnate below to the slender gynophore. Ovary stalked. Capsule elongate.

Flowers during the rainy season.

**Crataeva religiosa*, *Linn. Fl. Brit. Ind. I, p. 172.* Vern. *Barna.*

A spreading unarmed tree. Leaves deciduous, appearing with the flowers, long petioled, leaflets 3-6" long. Flowers in clusters at the end of new growths, greenish-yellow, at length purplish. Stamens longer than the petals, on the gynophore. Fruit a berry.

Flowers: April-May.

Capparis, *Linn.*

Small trees or climbing shrubs, armed with a pair of stipular thorns. Leaves simple. Flowers showy.

Capparis aphylla, *Roth. Fl. Brit. Ind. I, p. 174.*

A nearly leafless shrub with longitudinally furrowed bark

and reddish brown scarlet flowers. Leaves upto $\frac{1}{2}$ " long on young branches.

Flowers: March-May.

Capparis sepiaria, *Linn. Fl. Brit. Ind. I, p. 177.*

A climbing shrub with stipular spines. Flowers white or purplish.

Flowers: May-June.

Capparis horrida, *Linn. Fl. Brit. Ind. I, p. 178. Vern. His.*

A climbing shrub with stipular spines. Young parts clothed with dense ferruginous pubescence. White or purplish flowers.

Flowers: February-April.

X. RESEDACEÆ

***Reseda odorata**, *Linn. (Mignonette).*

Commonly grown in the garden as winter annual.

XI. VIOLACEÆ

***Viola tricolor**, *Linn. (Pansy).*

***Viola odorata**, *Linn. (Violet).*

XII. BIXACEÆ

Flacourtia sepiaria, *Roxb. Fl. Brit. Ind. I, p. 194. Vern. Kondai.*

A stiff thorny bush, the spines usually bearing flowers and fruits.

Bixa orellana, *Linn. Fl. Brit. Ind. I, p. 190. Vern. Latkan (Arnatto).*

A small tree. Leaves simple, 4-8" long, cordate. Flowers white. Sepals and petals 5. Anthers 5, opening by two

terminal pores. Ovary (2), 1-celled, ovules many on 2 parietal placentas.

Flowers: February-March.

XIII. POLYGALEÆ

Polygala, Linn.

Annual herbs with alternate leaves. Flowers irregular bisexual. Sepals 5. Unequal, 2 inner often petaloid, imbricate in bud. Petals 5 or 3 distinct, unequal, inferior usually keel-shaped. Stamens 8, hypogynous. Ovary tricarpeillary syncarpous, 1-3 celled. Fruit a 2-celled 2-seeded capsule.

Flowers during the rainy season.

Polygala erioptera, DC. *Fl. Brit. Ind.* I, p. 203.

Annual with few flowers and petaloid wings.

Polygala chinensis, Linn. *Fl. Brit. Ind.* I, p. 204.

Annual with herbaceous wings and persistent bracts.

XIV. CARYOPHYLLACEÆ

Saponaria vaccaria, Linn. *Fl. Brit. Ind.* I, p. 217.

A glabrous annual with pink flowers.

Spergula arvensis, Linn. *Fl. Brit. Ind.* I, p. 243. (Corn spurrey).

A green sparingly pubescent annual. Leaves $\frac{1}{2}$ -2", in false whorls, linear. Flowers white. Styles 5 or 3.

Polycarpea corymbosa, Lamk. *Fl. Brit. Ind.* I, p. 245.

An erect annual, much dichotomously branched. Leaves sessile, linear $1\frac{1}{3}$ -1". Flowers many, crowded on the much branched cymes, forming large flat topped silvery heads. Capsules very small, shining.

Flowers during the greater part of the year.

**Dianthus chinensis* (China pink). *Duthie. Fl., Vol. I, p. 64.*

**Dianthus caryophyllus* (Carnation.) *Duthie. Fl., Vol. I, p. 64.*

**Vescaria* sp.

XV. PORTULACEAE

Portulaca, *Linn.*

Diffuse annual herbs, usually succulent. Leaves opposite or alternate, entire. Flowers slightly perigynous, yellow. Ovules many.

All flowering during summer season especially opening
during noon.

Portulaca oleracea, *Linn. Fl. Brit. Ind. I, p. 246.* Vern. *Kulfa*.
(Indian purslane).

Flowers in terminal clusters.

Portulaca quadrifida, *Linn. Fl. Brit. Ind. I, p. 247.*

Flowers smaller terminal, yellow, solitary.

**Portulaca grandiflora*, *Linn.*

XVI. TAMARICACEAE

Tamarix dioica, *Linn. Fl. Brit. Ind. I, p. 249.* Vern. *Jhan*.

A moderate sized shrub with long spreading branches. Leaves minute, closely appressed. Flowers unisexual, purple-rose coloured in compact cylindrical spikes.

Flowers during the rainy season.

XVII. MALVACEAE

Malva sylvestris, *Linn. Fl. Brit. Ind. I, p. 320.*

Erect herb. Flowers pale rose streaked with purple. Corolla 3-4 times the length of the calyx.

Flowers during the winter season.

Malva parviflora, *Linn. Fl. Brit. Ind. I, p. 321.*

A small spreading herb. Corolla scarcely longer than the calyx.

Flowers during the winter season.

Malvastrum tricuspidatum, *A. Gray. Fl. Brit. Ind. I, p. 321.*

An erect branching herb, leaves ovate lanceolate, irregularly toothed. Flowers yellow.

Flowers nearly all the year round.

Sida. *Linn.*

Perennial herbs. Leaves simple often lobed. Bracteoles absent. Petals 5, yellow staminal-tube dividing at the summit into numerous anther-bearing filaments. Carpels 5-10.

Sida veronicaefolia, *Lamk Fl. Brit. Ind. I, p. 323.*

A procumbent trailing herb.

Sida spinosa, *Linn. Fl. Brit. Ind. I, p. 323.*

A small erect shrub with recurved spines below the petioles.

Sida acuta, *Burm. Fl. Brit. Ind. I, p. 323.*

Sida rhombifolia, *Linn. Fl. Brit. Ind. I, p. 323.*

Sida cordifolia, *Linn. Fl. Brit. Ind. I, p. 324.*

Abutilon, *Gaertn. Fl. Brit. Ind. I, p. 325.*

Shrubby plants. Leaves palmately lobed. Inflorescence axillary or terminal. Bracteoles absent. Flowers golden-yellow.

Abutilon asiaticum, *G. Don. Fl. Brit. Ind. I, p. 326.* Much bigger flowers 2" across.

Abutilon indicum, *Sweet Hort. Fl. Brit. Ind. I, p. 326.*

Smaller flowers 1" across.

Urena lobata, *Linn. Fl. Brit. Ind. I, p. 329.*

Herb with stellate hairs. Flowers clustered, pink. Meri-

carps covered with hooked bristles.

Flowers in the rainy season.

Hibiscus, Linn.

Herbs or shrubs. Leaves stipulate, palmately lobed. Inflorescence axillary.

Hibiscus cannabinus, Linn. Fl. Brit. Ind. I, p. 339.

Prickly herb. Corolla large spreading yellow with crimson-red in the centre.

Flowers during the rainy season.

***Hibiscus sabdariffa, Linn. Fl. Brit. Ind. I, p. 340. Vern. Patwa (Red sorrel).**

An erect glabrous annual. Stem reddish.

Bracteoles 8-12, adnate to the base of the calyx. Calyx accrescent, sepals connate below the middle into a deep-red fleshy cup. Corolla yellow.

***Hibiscus esculentus, Linn. Fl. Brit. Ind. I, p. 343. Vern. Bhindi.**

A tall annual covered with brittle hairs. Flowers large, yellow with crimson centre. Capsule 6-10" long.

Largely cultivated during August-October.

***Hibiscus rosa-sinensis, Linn. (Shoe-flower). Duthie. Fl., Vol. I, p. 87.**

***Thespesia populnea. Soland. Fl. Brit. Ind. I, p. 345.**

A tree with yellow flowers.

Gossypium neglectum, Linn. Fl. Brit. Ind. I, p. 346. Vern. Kapas.

Bombax malabaricum, DC. Fl. Brit. Ind. I, p. 349. Vern. Semal, (Silk Cotton).

A large handsome deciduous tree with straight buttressed trunk. Leaves large compound, 5-7 leaflets. Flowers large,

red. Petals fleshy. Stamens many in bundles, filaments pink. Anthers brown. Fruit capsule, testa of the seed with silk-cotton hairs. Flowering after leaf-fall. Pollinated by crows etc.

Flowers: March-April.

**Althaea rosea*, Linn. (Hollyhock). *Duthie Fl.*, Vol. I, p. 78.

**Adansonia digitata* Linn. (monkey's bread tree).

XVIII. STERCULIACEAE

**Pterospermum acerifolium*, Willd. *Fl. Brit. Ind.* I, p. 368.

Vern. *Kanak Champa*.

A large tree with large, grey tomentose beneath leaves. Flowers axillary, fragrant, white. Calyx deeply 5-cleft.

Flowers: February-March.

Helicteres isora, Linn. *Fl. Brit. Ind.* I, p. 365. Vern. *Marorphal*.

A shrub, young branches covered with stellate hairs. Flowers solitary or few flowered cymes. Calyx narrowly campanulate, curved. Petals red turning to lead colour, reflexed, the 2 lower shorter and broader than the 3 upper ones, long clawed. Staminal column fused with the gynophore exerted and reflexed above, anthers 10, surrounding the ovary, alternating in pairs with 5 minute scales. Fruit 2" long cylindrical. Composed of 5, spirally twisted tomentose follicles on a long gynophore.

Flowers during the rainy season.

Sterculia, Linn.

Trees or shrubs. Leaves palmately lobed. Flowers polygamous. Calyx tubular. Petals 0. Staminal-column being a head or ring of sessile anthers. Carpels 1-7, sessile or on gynophore. Fruit follicles, woody, pubescent.

***Sterculia villosa*, Roxb. *Fl. Brit. Ind.* I, p. 355.**

A small tree. Leaves 12-18" in length, crowded at the nodes. Flowers yellow, stellately hairy. Follicles sessile.

Flowers: January-February

***Sterculia urens*, Roxb. *Fl. Brit. Ind.* I, p. 355.**

A soft wooded tree, outer bark peeling off like paper. Leaves 8-12" long crowded at the ends of the branches. Flowers greenish-yellow, mostly male, petals absent.

Flowers: January-March.

XIX. TILIACEAE

***Grewia asiatica*, Linn. *Fl. Brit. Ind.* I, p. 386. Vern. *Phalsa*.**

A shrub with young shoots, under surface of leaves and inflorescence, clothed with grey or yellowish hairs. Leaves broadly ovate, rounded, 5 nerved at the base. Flowers yellow. Fruit a drupe purple in colour, 1 or 2 seeded.

Flowers: February-March.

***Triumfetta* Linn.**

Herbs with stellate hairs. Leaves serrate. Flowers small, yellow, in dense cymes. Sepals 5, petals 5, stamens 5-25. Ovary 2-5 celled with 2 ovules in each cell. Fruit globose.

***Triumfetta pilosa*, Roxb. *Fl. Brit. Ind.* I, p. 394.**

Fruit large globose, spines long, hispid on lower edges.

Flowers during the rainy season.

***Triumfetta neglecta*, W. and A. *Prod. Fl. Brit. Ind.* I, p. 396.**

Fruit oblong, spines ciliate on upper edges.

***Corchorus*, Linn.**

Herbs. Leaves simple. Flowers small yellow. Ovary 2-5 celled. Capsule elongated or subglobose, smooth or prickly.

Corchorus capsularis, *Linn. Fl. Brit. Ind. I, p. 397.* Vern.
Harawa.

Capsule globose.

Corchorus olitorious, *Linn. Fl. Brit. Ind. I, p. 397.*

Corchorus antichorus, *Roensch. Fl. Brit. Ind. I, p. 398.*

A small woody prostrate herb. Capsule $\frac{1}{2}$ - $1\frac{1}{4}$ long cylindric, 4-valved.

Flowers: March-May.

Corchorus acutangulus, *Lamk. Fl. Brit. Ind. I, p. 398.*

Capsule short, stout, winged.

XX. LINEAE

***Linum usitatissimum**, *Linn. Fl. Brit. Ind. I, p. 410.* Vern.
Alsi (Linseed).

Annual, erect. Leaves linear, lanceolate. Flowers blue.
Fruit capsule

Flowers: January-February.

XXI. MALPIGHIACEAE

Hiptage madablota, *Gaertn. Fl. Brit. Ind. I, p. 418.* Vern.
Madbumalti.

A handsome woody evergreen climber. Leaves opposite.
Flowers white fragrant. Fifth petal yellow at the base
Fruit 1-3 dry indehiscent, winged, 1-seeded.

Flowering season, hot weather.

***Malphigia laurifolia**

A large spreading shrub, with purplish flowers.

XXII. ZYGOPHYLLEAE

Tribulus terrestris, *Linn. Fl. Brit. Ind. I, p. 423.* Vern.
Gukebroo.

A prostrate annual, hairy. Leaves compound. Flowers yellow. Disc annular, 10-lobed. Stamens 10. Fruit 5-angled, spinous breaking up into cocci.

Flowers during the rainy season.

XXIII. GERANIACEAE

Oxalis, *Linn.*

Herbs with acid juice. Leaves usually 3-foliate, Sepals 5. Petals 5, Stamens 10. Ovary 5-celled, styles 5 distinct. Fruit regma.

Oxalis corniculata, *Linn. Fl. Brit. Ind. I, p. 436.* Vern. *Amrul.*

Perennial herb, creeping or subterranean stems, rooting at the nodes. Flowers yellow.

Flowers almost throughout the year.

***Oxalis corymbosa**, *DC.*

Leaves larger and pink flowers.

Flowers: February-March

Biophytum sensitivum, *DC. Fl. Brit. Ind. I, p. 436.*

Annual with pinnate sensitive leaves, 6-15 pairs, almost whorled at the top of the stem. Petiole swollen at the base. Flowers shortly pedicelled, golden yellow.

Flowers: December-February.

***Averrhoa carambola**, *Linn. Fl. Brit. Ind. I, p. 439.* Vern. *Kamrakh.*

Trees with alternate imparipinnate leaves. Flowers small, pink.

Flowers: September-October.

Impatiens, *Linn.*

Irregular and resupinate flowers.

Many species are cultivated in the gardens during the rainy season.

XXIV. RUTACEAE

Murraya *Linn.*

Unarmed shrubs. Leaves pinnate, leaflets alternate, petioled.

Murraya exotica, *Linn. Fl. Brit. Ind. I, p. 502.* Vern. *Kamni*.

Evergreen, leaflets 3-9, glabrous.

Murraya koenigii, *Spreng. Fl. Brit. Ind. I, p. 503.* Vern. *Gandbela*.

Strongly scented shrub, deciduous, leaflets 9-25 pairs, pubescent.

Citrus, *Linn. Fl. Brit. Ind. I, pp. 514-515.*

Evergreen shrubs, usually spinous. Leaves alternate, 1-foliate, petiole winged. Flowers white or pinkish. Stamen many in bundles. Ovary many-celled, ovules many, in each cell.

The following plants of this genus are cultivated in the gardens for fruits.

Citrus medica, *Linn. Var. medica proper*, Vern. *Bijaura* (The citron).

Citrus medica, *Linn. Var. Limonum*, Vern. *Jambira* (The lemon). *Fl. Brit. Ind. I, p. 515.*

Citrus medica, *Linn. Var. Acida*. Vern. *Numbu* (The sour-lime). *Fl. Brit. Ind. I, p. 515.*

Citrus medica, *Linn. Var. Limetta*. Vern. *Mitha Nimbu* (Sweet lime). *Fl. Brit. Ind. I, p. 515.*

Citrus medica, *Linn. Var. Lumia*. (Sweet lemon).

Citrus aurantium, *Linn. Var. proper*, Vern. *Narangi* (Sweet orange). *Fl. Brit. Ind. I, p. 515.*

Citrus aurantium, *Linn. Var. Bigaradia*. (Bitter orange). *Fl. Brit. Ind. I, p. 515.*

Citrus decumana, *Linn.* Vern. *Chakotra* (Pomelo or Shaddock). *Fl. Brit. Ind. I, p. 516.*

Feronia elephantum, *Correa Fl. Brit. Ind. I, p. 516.* Vern. *Kaitha.*

Spinous tree, compound leaves. Flowers polygamous. Fruit large globose, with a rough woody rind, 1-celled, many seeded.

Flowers: March-April.

Aegle marmelos, *Correa. Fl. Brit. Ind. I, p. 516.* Vern. *Bel.*

Spinous tree. Leaves 3-foliate. Flowers large white. Fruit large globose, rind woody. Seeds embedded in the pulp.

***Clausena wampi**, *Oliv. Dutbie. Fl., Vol. I, p. 138.*

A small tree, cultivated in the gardens for fruits.

Flowers: March-April.

XXV. SIMARUBEAE

Ailanthus excelsa, *Roxb. Fl. Brit. Ind. I, p. 518.* Vern. *Arna.*

Lofty trees. Leaves very large 1" or more, compound, leaflets on long stalks. Flowers polygamous, yellowish. Fruit samara.

Flowers: January-March.

Balanites aegyptiaca, *Delile. Fl. Brit. Ind. I, p. 522.* Vern. *Hingot.*

Spiny shrub or tree, branches ending in sharp thorns. Leaves 2-foliate, entire. Flowers in cymes, white fragrant. Fruit a large oily 1-seeded drupe.

Flowers: April-May.

XXVI. MELIACEAE

Melia, Linn.

Trees. Leaves pinnate or 2-3 pinnate, serrate. Flowers axillary panicles. Staminal-tube present. Fruit a drupe.

Melia azadirachta, Linn. *Fl. Brit. Ind. I*, p. 544. Vern. *Neem* (Margosa tree).

Leaves pinnate. Flowers white. Drupe 1-celled.

Flowers: March-May.

**Melia azedarach*, Linn. *Fl. Brit. Ind. I*, p. 544. Vern. *Bakain* (Persian lilac).

Leaves bipinnate. Flowers lilac. Drupe 5-celled.

Flowers: March-April.

Cedrela toona, Roxb. *Fl. Brit. Ind. I*, p. 568. Vern. *Toon*.

Trees with pinnate leaves and small bisexual flowers. Filaments free. Fruit a capsule.

Flowers: March-April.

**Swietenia mahogani*, Linn. (Mahogany tree).

A handsome pyramidal evergreen tree.

XXVII. RHAMNEAE

Zizyphus, Juss..

Shrubs or trees, often decumbent, armed with sharp hooked stipular spines. Leaves alternate. Flowers fascicled, sessile or in cymes. Ovary sunk in the disc. Fruit fleshy. 1-4 seeded.

Zizyphus jujuba, Lamk. *Fl. Brit. Ind. I*, p. 632. Vern. *Ber*.

Tree. Fleshy fruit $\frac{1}{2}$ - $\frac{3}{4}$ " long.

Flowers: September-November.

Zizyphus rotundifolia, *Lamk. Fl. Brit. Ind. I, p. 633.* Vern. *Jherber.*

A small thorny tomentose bush.

Flowers: March-June.

Zizyphus oenoplia, *Mill. Fl. Brit. Ind. I, p. 634.*

A straggling or climbing shrub. Fruit $\frac{1}{4}$ " long.

Flowers: April-May.

Zizyphus xylopyrus, *Willd. Fl. Brit. Ind. I, p. 634.* Vern. *Kathber.*

Drupe nearly dry.

Flowers: April-May.

XXVIII. AMPELIDEAE

Vitis, *Linn.*

Sarmentose shrubs, climbing, usually by means of leaf opposed tendrils. Leaves digitately 3-5 foliate. Flowers crowded, sometimes polygamous. Ovary 2-celled, 2 ovules in each cell. Fruit a berry, ovoid 1-2 seeded.

Vitis quadrangularis, *Linn. Fl. Brit. Ind. I, p. 645.*

Stems succulent, 4-winged very thick, leaves broad, cordate. Tendrils opposite to the leaves, cymose branching, sympodium.

***Vitis vinifera**, *Linn. Fl. Brit. Ind. I, p. 652.* Vern. *Angur* (the grape vine).

Leaves 5-foliate. Under surface of leaves with grey hairs. Inflorescence not bifurcate. Petals 5.

Flowers: May-June.

Vitis trifolia, *Linn. Fl. Brit. Ind. I, p. 654.* Vern. *Amalbel.*

Leaves 3-foliate. Petals 4.

Flowers: May-June.

XXIX. SAPINDACEAE

Sapindus, *Linn.*

Trees or shrubs. Leaves alternate, exstipulate. Flowers regular polygamous. Sepals 4-5, imbricate. Petals 4-5, with or without scales. Disc annular, fleshy. Stamens 8-10. Ovary entire, 2-4 lobed, 2-4-celled solitary ovule in each cell.

Sapindus laurifolius, *Vahl. Fl. Brit. Ind. I, p. 682.* Vern. *Ritha* (Soap tree).

Trees. Leaves compound, opposite, usually paripinnate, Leaflets 4-6. Flowers polygamous, in terminal or axillary panicles.

Flowers during the winter season.

Sapindus mukorossi, *Gaertn. Fl. Brit. Ind. I, p. 683.*

Leaflets 10-16, alternate.

Flowers in the winter season.

Schleichera trijuga, *Willd. Fl. Brit. Ind. II, p. 681.* Vern. *Kusum*.

Trees. Leaves alternate, pinnate, leaflets entire. Petals 0, Stamens 5-8 Ovary 3-4 celled, ovules solitary in each cell. Fruit indehiscent

Flowers: April-May.

XXX. ANACARDIACEAE

Mangifera indica, *Linn. Fl. Brit. Ind. II, p. 13.* Vern. *Am* (Mango tree).

Tree. Leaves alternate, simple, petiolate, entire, coriaceous. Flowers small polygamous. Stamens 1-5, usually one perfect and much longer than the others. Ovary sessile, 1-celled. Drupe large.

Flowers: February-April.

Spondias mangifera, Willd. *Fl. Brit. Ind. II*, p. 42. Vern. *Amra*.

A small tree. Leaves alternate, 1-1½ ft. leaflets 4-6 pairs 2-9" long, entire. Flowers small, polygamous. Fruit a drupe.

Flowers: May-July.

XXXI. MORINGEAE

Moringa pterygosperma, Gaertn. *Fl. Brit. Ind. II*, p. 45. Vern. *Sainjan*.

A small tree, with soft wood. Leaves 1-2" usually 3-pinnate. Flowers in panicles, pedicellate, white, perigynous. Calyx 5-cleft. Petals 5, unequal. Stamens (fertile) 5, alternating with 5 antherless filaments. Anthers 1-celled. Ovary tricarpeal, 1-celled, 3 parietal placentas. Fruit elongate capsule, pendulous, 9-ribbed.

Flowers: January-March.

XXXII. LEGUMINOSAE

PAPILIONATAE.

Heylandia latebrosa, DC. *Fl. Brit. Ind. II*, p. 65.

A prostrate much branched herb. Leaves simple, exstipulate alternate, hairy. Flowers small, solitary, axillary, yellow. Pod oblong, hairy, flat, 1-2 seeded.

Crotalaria, Linn.

Herbs or shrubs with simple or 3-foliate leaves. Stamens 1-adelphous. Pod sessile, straight, 2-seeded.

Crotalaria alata, Buch-Ham. *Fl. Brit. Ind. II*, p. 69.

A sub-erect undershrub, silky pubescent. Leaves simple 2-3" long. Ovate-oblong, stipule decurrent. Flowers pale yellow. Pod 1¼"-1¾" long 30-40 seeded.

Crotalaria sericea, Retz. *Fl. Brit. Ind. II*, p. 75. Vern. *Sanni*.

Erect herbs. Leaves simple 2"-6" long, oblong-lanceolate. Stipules large persistent. Racemes terminal long. Corolla yellow tinged with purple. Pod 1"-2" glabrous.

Flowers during the cold season.

Crotalaria tetragona, Roxb. *Fl. Brit. Ind. II*, p. 78.

An erect shrub, upto 6' high, finely silky. Leaves simple. Flowers yellow. Pod upto 2" densely and persistently velvety, dark-brown, 10-20-seeded.

Flowers during the cold season.

***Crotalaria juncea**, Linn. *Fl. Brit. Ind. II*, p. 79. Vern. *Sanai* (*San Hemp*).

A tall stiff shrub. Branches rod-like, terete, thinly silky. Pod 1"-1½", clothed with persistent hairs, 10-15 seeded.

Crotalaria medicaginea, Lamk. *Fl. Brit. Ind. II*, p. 81.

A small perennial herb. Leaves small 3-foliolate. Pod obliquely subglobose, 1/8" long, 2-seeded clothed with appressed hairs.

Flowers: August-November.

Melilotus, Juss.

Annual. Leaves pinnately 3-foliolate, leaflets toothed. Flowers in long racemes. Stamens diadelphous. Pods 1-2 seeded.

Melilotus indica, All. *Fl. Brit. Ind. II*, p. 89.

Flowers yellow. Pod 1-seeded.

A cold-weather weed.

Melilotus alba, Desr. *Fl. Brit. Ind. II*, p. 89.

Flowers white. Pod 2-seeded.

Flowers during winter season.

***Trigonella foenum-graecum**, *Linn. Fl. Brit. Ind. II, p. 87.*
 Vern. *Methi*.

Erect annual. Leaves 3-foliate, toothed. Flowers pale-yellow. Stamens diadelphous. Pod 2"-3" long. 10-20 seeded.

Flowers during the cold weather.

Medicago, *Linn.*

Herbs. Leaves pinnately 3-foliate, leaflets toothed. Stamens diadelphous. Pod spirally twisted, 1-many seeded.

Medicago lupulina, *Linn. Fl. Brit. Ind. II, p. 90.*

Pod unarmed, 1-seeded.

Medicago denticulata, *Willd. Fl. Brit. Ind. II, p. 90.*

Pod bordered with spines, many seeded.

Flowers during the winter season.

Cajanus indicus, *Spreng. Fl. Brit. Ind. II, p. 217.* Vern. *Arbar* (Pigeon pea).

An erect shrub 5-10 ft. high. Leaves 3-foliate, gland-dotted and densely silky beneath. Corolla yellow, veined with red. Stamens 2-adelphous. Pod 2"-3" long, finely downy.

Flowers: December-February.

Rhynchosia, *Lour.*

Twining herbs. Leaves pinnately 3-foliate, gland-dotted beneath. Flowers axillary. Stamens diadelphous. Pod oblong, flat.

Rhynchosia minima, *DC. Prod. Fl. Brit. Ind. II, p. 223.*

A twining annual herb. Leaflet $\frac{1}{4}$ "-1" and as broad as long. Petals yellow. Pod $\frac{1}{2}$ ", 2-seeded.

Rhynchosia sericea, *Spanoghe. Fl. Brit. Ind. II, p. 225.*

Climbing herb. Leaflets 1-1 $\frac{1}{2}$ ". Pod 1-1 $\frac{1}{4}$ ", 2-seeded.

Phaseolus, *Linn.*

Herbaceous twiners with 3-foliate leaves. Flowers in copious axillary racemes. Anthers diadelphous. Pod linear, septate between the seeds.

Phaseolus aconitifolius, *Jacq. Fl. Brit. Ind. II, p. 202.* Vern. *Moth.*

Branches usually not twining. Pod cylindrical glabrous.

***Phaseolus radiatus**, *Linn. Fl. Brit. Ind. II, p. 203.* Vern. *Mung.*

A much branched suberect hairy annual. Leaves dark-green. Pod hairy, spreading, $1\frac{1}{2}$ "- $2\frac{1}{2}$ " long.

Cultivated as a rainy season crop.

***Phaseolus mungo**, *var. radiatus. Linn. Fl. Brit. Ind. II, p. 203.* Vern. *Urd.*

Stems more trailing than the former. Leaves yellowish-green. Pod erect, seeds larger.

Cultivated as a rainy season crop.

***Vigna catiang**, *Walp. Fl. Brit. Ind. II, p. 205.* Vern. *Lobia.*

A suberect twining annual. Leaves compound. Corolla yellow or reddish. Pod 4"-24", depressed between the seeds.

Cultivated as a rainy season crop.

***Dolichos lablab**, *Linn. Fl. Brit. Ind. II, p. 209.* Vern. *Sem.*

Twining herb with compound leaves. Stamens 2-adelphous. Pod flat, linear, recurved.

Flowers: November-December.

Clitoria terneata, *Linn. Fl. Brit. Ind. II, p. 208.*

A climber with 3-7 foliate leaves. Flowers solitary axillary. Corolla bright blue. Pod 2"-4", flat, 6-10 seeded.

Flowers during the rainy season.

Butea frondosa, *Roxb. Fl. Brit. Ind. II, p. 194.* Vern. *Dbak*
or *Palas*.

A small tree with crooked trunk. Leaves compound, petio-
late 3-6" long, leaflets 4"-8" long, rigidly coriaceous.
Branches and inflorescence brown-velvety. Flowers
densely fascicled. Petals bright orange-red, silvery tomen-
tose outside. Stamens 2-adelphous. Pod 4"-8".

Flowers during March-April.

Mucuna pruriens, *DC. Fl. Brit. Ind. II, p. 187* Vern. *Kaunb*.

A climber. Pod 2-3" long, 5 seeded, turgid, clothed
with dense very pungent irritating hairs.

Flowers during the rainy season.

Sesbania, *Pers.*

Herbs or shrubs, with long narrow abruptly pinnate leaves,
leaflets very numerous. Flowers axillary racemes. Sta-
mens 2-adelphous. Pod very long.

Sesbania aegyptiaca, *Pers. Fl. Brit. Ind. II, p. 114.* Vern. *Jait*.

Perennial unarmed shrub. Flowers small, yellow or
spotted with purple.

Flowers during the cold season.

Sesbania aculeata, *Pers. Fl. Brit. Ind. II, p. 115.* Vern.
Jayanti.

Annual prickly herb. Flowers small yellow.

Sesbania grandiflora, *Pers. Fl. Brit. Ind. II, p. 115.* Vern.
Basna or *August*.

A soft wooded tree. Flowers large, white or pink.

Flowers: October-December.

Tephrosia, *Pers.*

Herbs with odd-pinnate or simple leaves. Flowers leaf-
opposed or axillary racemes. Pod linear, flattened.

Tephrosia tenuis, *Wall. Fl. Brit. Ind. II, p. 111.*

An annual with caespitose habit. Leaves simple. Flowers in axillary racemes.

Tephrosia purpurea, *Pers. Fl. Brit. Ind. II, p. 112.*

A much branched perennial. Flowers on leaf-opposed racemes, pink.

Flowers: August-November.

Indigofera, *Linn.*

Herbs clothed with appressed hairs. Flowers in axillary racemes. Pod cylindrical or globose.

Indigofera linifolia, *Retz. Fl. Brit. Ind. II, p. 92.* Vern. *Torki.*

A procumbent silvery pubescent herb. Leaves simple $\frac{1}{2}$ "-1" long. Pod minute globose 1-seeded.

Flowers during the rainy season.

Indigofera cordifolia, *Heyne. Fl. Brit. Ind. II, p. 93.*

A copiously branched diffuse annual with long white hairs. Leaves simple $\frac{1}{4}$ "- $\frac{3}{4}$ " long, ovate cordate. Pod $\frac{1}{4}$ " long, beaked, 2-seeded.

Indigofera enneaphylla, *Linn. Fl. Brit. Ind. II, p. 94.*

Annual or perennial with woody root-stock, densely caespitose trailing. Leaves compound, 5-9 foliate, leaflets small. Flowers small red, crowded, sessile. Pod $\frac{1}{8}$ ", cylindrical 2-seeded with a septum between the two.

Flowers almost throughout the year.

***Cicer arietinum**, *Linn. Fl. Brit. Ind. II, p. 176.* Vern. *Chana* (Gram).

An annual with imparipinnate leaves. Corolla pink or blue. Pod $\frac{3}{4}$ "-1" turgid, pubescent.

Flowers: December-January.

***Lens esculenta**, Moench. *Fl. Brit. Ind. II*, p. 179. Vern. *Masur* (the lentil).

A small erect pubescent herb. Leaves pinnate, 4-6 pairs. Corolla pale purple. Pod $\frac{1}{2}$ " long smooth. Seeds 2.

A cold weather crop.

Vicia, Linn.

Annual. Leaves paripinnate ending in twisted tendrils. Stamens 2-adelphous. Pod oblong rhomboid, turgid, hairy.

Vicia hirsuta, Gray. *Fl. Brit. Ind. II*, p. 177.

Pod 2-seeded.

Common weed during the cold weather.

Vicia sativa, Linn. *Fl. Brit. Ind. II*, p. 178. (Common Vetch).

Style bearded on lower side near the tip. Pod more than 2-seeded.

Common weed during the cold weather.

***Vicia faba**, Linn. *Duthie. Fl., Vol. I*, p. 259. Vern. *Bakla* (Broad Bean).

Pod minutely hairy, beaked, 3-4 seeded.

Commonly cultivated during the winter season.

Lathyrus, Linn.

Annual herbs with paripinnate, entire leaves, ending in a tendril or bristle. Pod flat.

Lathyrus aphaca, Linn. *Fl. Brit. Ind. II*, p. 179.

Annual with slender wingless much branched stems. Stipules in pairs, appressed to the stem, leaf-like, hastate, entire, leaflets abortive. Flowers yellow. Pod 4-6 seeded.

A common weed of the winter season.

***Lathyrus sativus**, Linn. *Fl. Brit. Ind. II*, p. 180. Vern. *Kasari*.

Much branched annual with winged stems. Leaflets 2.

Flowers red or bluish. Pod oblong, winged on the back, 4-5 seeded.

A common weed of the winter season.

Lathyrus sphaericus, *Retz. Fl. Brit. Ind. II, p. 180.*

Much branched annual with wingless stems. Pod wingless, linear many seeded.

Flowering during the winter season.

***Lathyrus odorata**, *Linn. Fl. Brit. Ind. II, p. 180.* (Sweet pea).

Commonly grown during the winter season in the gardens.

Pisum, *Linn.*

Very much like *Lathyrus* excepting its thick, laterally compressed, dilated style.

***Pisum arvense**, *Linn. Fl. Brit. Ind. II, p. 181.* Vern. *Desi-mattar* (Field Pea).

Annual. Leaves compound, 4-6 leaflets, ending in a branched tendril. Stipules large, ovate, irregularly toothed. Standard pink.

Common during the winter season.

***Pisum sativum**, *Linn. Fl. Brit. Ind. II, p. 181.* Vern. *Gol Mattar* (Garden Pea).

A more robust plant than the preceding. Flowers white on longer peduncles. Pod broader.

Cultivated during the winter season.

Arbus precatorius, *Linn. Fl. Brit. Ind. II, p. 175.* Vern. *Ghunchi*.

Climbing shrubs. Leaves with numerous leaflets, paripinnate, 10-20 pairs. Racemes crowded, many flowered.

Corolla pink or white. Pod linear, oblong, turgid, 3-5 seeded. Seeds subglobose, scarlet with a black hilum.

Flowers: August-September.

Dalbergia sissoo, *Roxb. Fl. Brit. Ind. II, p. 231. Vern. Shisham.*

A large deciduous tree. Leaflets 3-5, alternate, ovate, acuminate. Corolla yellowish-white. Stamens 9. Pod strap-shaped 2-3 seeded.

Flowers: March-May.

***Pongamia glabra**, *Vent. Fl. Brit. Ind. II, p. 240.*

Tree. Leaves odd-pinnate, leaflets opposite, 5-7. Petals white tinged with pink.

Flowers: April-May.

Aes chynemone aspera, *Linn. Fl. Brit. Ind. II, p. 152.*

A tall erect aquatic perennial. Stem pith-like. Flowers yellow. Pod 2-3" long, joints 3-8.

Flowers during the rains.

Alysicarpus, *Neck.*

Diffuse annual. Leaves 1-foliate. Flowers on leaf-opposed spikes. Calyx much longer than the first joint of the pod. Pod terete or turgid of several 1-seeded indehiscent joints.

Alysicarpus bupleurifolius, *DC. Fl. Brit. Ind. II, p. 158.*

Alysicarpus longifolius, *W. and A. Prod Fl. Brit. Ind. II, p. 158.*

Both of them commonly seen during the rains.

Alhagi camelorum, *Desv. Fl. Brit. Ind. II, p. 145. Vern. Jamwasa.*

Small spinous shrubs. Spines axillary. Leaves simple.

Flowers 1-6 on the spines. Corolla reddish. Pod 1", irregularly constricted between the seeds.

Flowers: April-May.

Desmodium, *Desv.*

Herbs and shrubs. Leaves 1-3 foliate. Flowers usually small many. Pod composed of several 1-seeded indehiscent joints, the faces compressed.

Desmodium triflorum, *DC. Prod. Fl. Brit. Ind. II, p. 173.*

A small trailing herb. Leaves 3-foliate, leaflets $\frac{1}{4}$ ", obovate, emarginate, corolla pink or purple. Pod $\frac{1}{2}$ ".

Desmodium parviflorum, *DC. Fl. Brit. Ind. II, p. 174.*

A procumbent wide trailing herb. Leaves 3-foliate, $\frac{1}{2}$ " oval. Racemes 6-8 flowered. Pod $\frac{1}{2}$ ". Joints 3-4.

Flowers in the rainy season.

Desmodium gangeticum, *DC. Prod. Fl. Brit. Ind. II, p. 168.*

Vern. *Salpan*.

A slender trailing shrub. Branches hairy. Leaves 1-foliate. Petiole 1". Leaflets 4-6" long, ovate oblong. Racemes copious 6-12" long. Pod $\frac{3}{4}$ ", deeply indented. Joints 6-8, clothed with minute hooked hairs.

CAESALPINIOIDEAE.

Cassia, *Linn.*

Erect shrubs, trees or herbs. Leaves abruptly paripinnate. Flowers large showy in racemes. Petals 5, imbricate. Stamen rarely all perfect, 3-5 often staminodes. Pod terete, flat.

Cassia fistula, *Linn. Fl. Brit. Ind. II, p. 261.* Vern. *Amaltas*.

A medium sized tree. Leaves compound, 8-16" long, leaflets 4-8 pairs. Flowers bright yellow on long pendulous racemes. Stamens 20, unequal. Pod cylindrical, pendu-

lous 1-2" long, 1" in diameter, indehiscent, smooth, hard, black, transversely divided.

Flowers: April-June.

Cassia occidentalis, *Linn. Fl. Brit. Ind. II, p. 262.*

A diffuse undershrub, annual. Leaves 6-8" long, petiolate with a single gland at the base; leaflets 3-5 pairs, ovate-oblong or lanceolate. Perfect stamens 7. Pod 4" long.

Common weed during the rainy season.

Cassia obtusifolia, *Linn. Fl. Brit. Ind., p. 263. Vern. Panwar.*

An annual with 3-4" long leaves. Leaflets 3 pairs, ovate oblong rounded at the base. Perfect stamens 7. Pod 8-10" long.

Common weed during the rainy season.

Bauhinia, *Linn.*

Unarmed erect trees or climbers with circinnate tendrils. Leaves simple, usually deeply cleft at the tip, rarely entire or divided into 2 leaflets. Flowers usually showy. Calyx spathaceous or cleft into 2 or 5 teeth. Petals 5, subequal with a distinct claw. Stamens 10 or less, if less with or without sterile filaments, versatile anthers. Ovary stalked, many ovules. Pod oblong, linear flat.

Bauhinia purpurea, *Linn. Fl. Brit. Ind. II, p. 284. Vern. Khairwal.*

A medium sized tree. Leaves 3-6" long, 9-11 nerved. Flowers few, deep rose coloured. Fertile stamens 3 or 4. Pod 6-12" long, flat.

Flowers: September-November.

**Bauhinia variegata*, *Linn. Fl. Brit. Ind. II*, p. 284. Vern. *Kachnar*.

Very similar in habit to the preceding one. Calyx spathaceous, stamens 5.

Flowers: February-April.

**Bauhinia acuminata*, *Linn. Fl. Brit. Ind. II*, p. 276.

An erect shrub with white flowers.

A cultivated garden plant.

Tamarindus indica, *Linn. Fl. Brit. Ind. II*, p. 273. Vern. *Imli*.

A large handsome tree, 80 ft. or more in height. Leaves 3-6" long, leaflets 10-20 pairs, oblong, obtuse. Flowers few. Pedicels jointed at the base of the calyx. Petals less than $\frac{1}{2}$ " long, only 3 yellow striped with red. Stamens 1-adelphous, 3 only. Pod 3-8" long.

Caesalpinia bounducella, *Flem. Fl. Brit. Ind. II*, p. 254. Vern. *Kathkaranj*.

A scandent shrub, all parts armed with short yellow prickles. Leaves 8-12" long, bipinnate, pinnae 6-8 pairs. Leaflets 6-10 pairs, $\frac{1}{2}$ " long. Petals 5, yellow, the upper smaller and spotted with red. Pod 2-3" oblong, densely armed with sharp wiry prickles, dehiscent.

Flowers during the rainy season.

Caesalpinia pulcherrima, *Swartz. Duthie. Fl., Vol. I*, p. 303.

A large shrub with handsome orange and yellow flowers.

**Ponciana regia*, *Bojer. Duthie. Fl., Vol. I*, p. 303.

A handsome tree cultivated in the gardens with scarlet or yellow flowers.

Parkinsonia aculeata, *Linn Fl. Brit. Ind. II*, p. 260. Vern. *Vilayati Kikar*.

A shrub armed with woody spines, which represent the

primary rachis of a bipinnate leaf and have 2-6 pinnae, congested in their axils. Pinnae 6-12" long, rachis much flattened, leaflets oblanceolate. Racemes shorter than the leaves. Petals 5, yellow, the upper one with a long claw. Stamens 10. Pod 3-4" turgid, dry, moniliform.

Flowers: February-April

MIMOSOIDEAE

Neptunia oleracea, *Lour. Fl. Brit. Ind. II, p. 285*. Vern. *Lajalu*.

An aquatic herb with creeping or floating stems, rooting at the nodes. Leaves bipinnate with sensitive membranous leaflets. Flowers small in dense heads. Pod $\frac{1}{2}$ -1" oblique oblong, beaked.

Flowers during the rainy and cold seasons.

***Leucaena glauca**, *Benth. Fl. Brit. Ind. II, p. 290*.

Shrub or a small tree with large bipinnate leaves. Corolla white. Pod 5"-6" straight, linear, flat, many seeded.

***Prosopis juliflora**, *DC. Duthie. Fl. I, p. 309*.

Plants have been successfully grown in the gardens. The sweet pods are largely used as food and as fodder for cattles.

Mimosa, *Linn.*

Herbs with or without prickles. Leaves bipinnate. Leaflets small sensitive. Flowers small in globose heads, mostly 4-merous. Pod flat, membranous, made up of 1-seeded joints that separate when mature from the sutures.

Mimosa pudica, *Linn. Fl. Brit. Ind. II, p. 291*. Vern. *Lajwanti* (the sensitive plant).

A widely spreading herb. Stems and branches prickly.

Leaves very sensitive. Leaflets 12-20 pairs. Stamens 4.
Pod $\frac{3}{4}$ -1" flat. 3-5 joints.

Flowers during the rainy season.

Acacia, Willd.

Spinous or prickly shrubs or trees. Erect. Leaves bipinnate with minute leaflets. Flowers in globose heads or cylindrical spike. Stamens free indefinite. Pod dehiscent.

***Acacia farnesiana, Willd. Fl. Brit. Ind. II, p. 292.** Vern. *Vilayati Kikar*.

A shrub or small tree with stipular spines. Pinnae 4-8 pairs, 1-1 $\frac{1}{2}$ ", leaflets 10-20 pairs $\frac{1}{4}$ " long. Flowers bright yellow, fragrant. Pod thick cylindrical.

Acacia arabica, Willd. Fl. Brit. Ind. II, p. 293. Vern. *Babul Kikar*.

A medium sized evergreen tree with dark-brown bark. Stipular spines $\frac{1}{4}$ -2" long. Flower-heads small, yellow. Pod flat moniliform.

Flowers: July-November.

Acacia leucophloea, Willd. Fl. Brit. Ind. II, p. 294. Vern. *Safed Kikar*.

A medium sized grey tomentose thorny tree. Corolla very small, pale yellow or white.

Flowers during the hot and rainy seasons.

***Acacia catechu, Willd. Fl. Brit. Ind. II, p. 295.** Vern. *Khair*.

A moderate-sized tree with thorny branches, rough dark-coloured bark. Spike cylindrical.

Flowers: May-July.

***Acacia melanoxylon. Brandis. p. 269.** (Australian Buck-wood).

A large tree with coriaceous, oblanceolate phyllodia (ver-

tically) dilated leaf-stalks instead of leaves, except in young trees and branches, which have bipinnate leaves at the end of phyllodia. Flowers in racemes, yellow.

***Acacia sphaerocephala**, *Cham. et. Schlecht.*

A thorny tree. The stipular thorns are thin-walled and serve as dwelling places for ants, which bore holes into them near tip. At the end of the leaflets there are few small ovoid structures which are collected and eaten by ants (Belt's corpuscles). This plant is a good example of myrmecophily.

Albizzia, *Duraz.*

Trees. Leaves bipinnate. Flowers in globose heads. Corolla large funnel shaped. Stamens indefinite, 1-adelphous. Pod large, thin, flat, strap-shaped.

Albizzia, lebbek, *Benth. Fl. Brit. Ind. II, p. 298.* Vern. *Siris*.

A large unarmed deciduous tree. Leaves evenly bipinnate, leaflets 6-20 pairs. Flowers stalked, white, fragrant. Corolla twice as long as the calyx. Pod 4-12" long by 1-2" broad flat, compressed smooth.

Flowers: April-May.

***Albizzia odorotissima**, *Benth. Fl. Brit. Ind. II, p. 299.* Vern. *Kali siris*.

A tall erect unarmed tree. Pinnae 3-4 pairs, 5-8 seeded.

***Albizzia lucida**, *Benth. Fl. Brit. Ind. II, p. 299.*

A handsome almost evergreen tree with large dark green acuminate leaflets.

***Pithecolobium dulce**, *Benth. Fl. Brit. Ind. II, p. 302.* Vern. *Vilayati Imli*.

A large thorny tree. Pods are thick, fleshy twisted.

***Saraca indica**, *Linn. Vern. Ashok. Duthie. I, p. 297.*

Cultivated in the gardens with orange-red flowers. Calyx

with the disc at the summit of a cylindrical tube, 4-partite, petaloid, corolla absent. Stamens 3-8 exserted.

Flowers: March-May.

XXXIII. ROSACEAE

Potentilla supina, *Linn. Fl. Brit. Ind. II, p. 359.*

Annual herb. Stems many leafy. Leaves compound 3-9 foliate, leaflets opposite or alternate, cuneate, obtuse, serrate. Stipules entire. Flowers $\frac{1}{4}$ - $\frac{3}{4}$ " across on axillary pedicels. Petals yellow. Fruit an etaerio of achenes, minute.

Flowers: February-June.

**Rosa* sp. Many varieties of roses are cultivated in the gardens.

**Prunus persica*, *Stokes. Vern. Arn. (Peach).*

**Prunus armeniaca*, *Linn. Vern. Zardalu. (Apricot).*

**Prunus communis*, *Huds. Vern. Alucha. (The Bullace).*

**Fragaria vesca*, *Linn. (The Strawberry).*

**Pyrus sinensis*, *Lindl. Vern. Nashpati. (The Pear).*

**Pyrus malus*, *Linn. Vern. Seb. (The Apple).*

**Eryobotrya japonica*, *Lindl. Vern. Loquat. (The Loquat tree).*

XXXIV. CRASSULACEAE.

**Bryophyllum calycinum*, *Salisb. Fl. Brit. Ind. II, p. 413.*

Tall, erect herbs, perennial. Leaves opposite, crenate, succulent. Flowers large, pendent. Calyx with a long inflated tube, lobes 4, short, valvate. Corolla campanulate, 4-fid. Stamens 8, in two series, hypogynous scales 4. Carpels 4, free or connate at the base, ovules many. Follicles 4, many seeded.

In the crenatures of the leaves of the plant, buds are easily formed which develop, drop off and at once produce new plants.

***Kalanchoe spathulata**, DC. *Fl. Brit. Ind. II*, p. 414.

A glabrous succulent perennial herb. Leaves spathulate, oblong, crenate, upto 10" long. Flowers yellow in corymbs. Stamens 8, in two series. Carpels 4. Fruit an eterio of follicles, 4.

XXXV. COMBRETACEAE.

Terminalia, Linn.

Large trees. Leaves alternate, entire. Flowers small, hermaphrodite. Calyx-tube produced above the ovary, 5-limbed. Petals 0. Stamens 10. Ovary 1-celled, ovules 2 or 3, pendulous. Fruit ovoid, winged.

***Terminalia belerica**, Roxb. *Fl. Brit. Ind. II*, p. 445. Vern. *Bahera*.

A deciduous tree. Leaves 3-8", alternate, coriaceous. Flowers small, polygamous or hermaphrodite. Fruit drupe, ovoid.

Flowers: March-June.

***Terminalia glabra**, W. & A. *Prod. Fl. Brit. Ind. II*, p. 447. Vern. *Kova* or *Arjuna*.

A large tree with a buttressed trunk. Leaves 5-8", sub-opposite. Fruit 1-2" long, ovoid with wings.

Flowers: March-June.

***Anogeisus pendula**, Wall. *Fl. Brit. Ind. II*, p. 451. Vern. *Dhao*.

A small tree with pendulous branches. Leaves alternate, lanceolate. Flowers in heads on long slender axillary peduncles. Petals absent. Stamens in two series.

Flowers in August.

***Quisqualis indica**, Linn. *Duthie. Fl., Vol. I*, p. 340.

Found in gardens. A handsome scandent shrub with white turning to bright-red flowers.

Flowers: April-September.

XXXVI. MYRTACEAE

**Eugenia jambolana*, *Lamk. Fl. Brit. Ind. II*, p. 499. Vern. *Jaman*.

A medium-sized tree. Leaves opposite, coriaceous, oblong, ovate, acuminate. Flowers many, sessile, $2/3$ " across, white. Calyx campanulate. Petals 4 or 5, free. Stamens many, anthers versatile. Ovary 2-celled, many ovules in each cell. Fruit a berry, oblong, dark-purple, juicy, 1-seeded.

Flowers: March-April.

**Psidium guyava*, *Linn. Vern. Amrud* (The Guava).

Extensively grown as cultivated plant for its fruit. Flowers white.

Flowers during the summer and rainy seasons

**Eucalyptus* sp.

Evergreen tree; very long size with white smooth trunk, usually secreting aromatic resinous gums. Many species are grown as garden plants.

Flowers: March-April.

**Callistemon indicum*, (*lancolatum*). *R. B.* (The Bottle-brush tree).

A small evergreen tree. Flowers crimson red in terminal spikes.

Flowers: March-January.

**Melaleuca leucodendron*, *Linn.*

Very similar to the preceding one excepting with white flowers.

**Barringtonia acutangula*, *Forst. Fl. Brit. Ind. II*, p. 508.

A small tree. Leaves 2-5" long, minutely denticulate,

lateral nerves 10-13 pairs. Flowers in elongated spikes. Petals small, deep pink. Ovary 2-celled. Fruit $1\frac{1}{4}$ - $1\frac{1}{2}$ " long.

Flowers: May-June.

XXXVII. LYTHRACEAE

Ammania baccifera, *Linn. Fl. Brit. Ind. II, p. 569.*

Annual, glabrous herbs, growing in damp places. Branches often 4-angular. Leaves opposite, alternate, entire, exstipulate. Flowers small, axillary, clustered. Calyx campanulate. Petals absent. Stamens 2-8. Ovary enclosed, 1-5 celled. Ovules many. Fruit a pyxidium, breaking up by a lid. Seeds many.

Flowers: November-January.

Lawsonia alba, *Lamk. Fl. Brit. Ind. II, p. 573.* Vern. *Mehudi*.

An erect shrub, sometimes spinous. Leaves opposite, entire, lanceolate. Flowers small in large terminal crowded cymes. Corolla white. Ovary 4, free slightly fused, 4-celled at the base. Ovules many on axile placenta.

Flowers during greater part of the year.

Lagerstroemia, *Linn.*

Trees or shrubs. Leaves opposite, entire, oblong. Panicles 3-chotomous. Flowers large. Calyx tube funnel-shaped, lobes 6-7, valvate. Petals 6-7, clawed. Stamens many, filaments long. Ovary 2-6 celled, ovules many. Fruit capsule.

***Lagerstroemia parviflora**, *Roxb. Fl. Brit. Ind. II, p. 575.*

A large tree. Leaves $2-3\frac{1}{2}$ " long, opposite, oblong-ovate, coriaceous. Flowers $\frac{1}{4}$ " across, white. Six outer stamens with larger filaments. Capsule ovoid, cylindrical.

Flowers: April-June.

**Lagerstroemia Flos-Regina*, Retz.

Largely cultivated as an ornamental tree. It bears handsome purple flowers during the rainy season.

**Lagerstroemia indica*, Linn. Vern. *Saoni*.

A shrub with showy pink and white flowers.

Flowers during the rainy season.

**Punica granatum*, Linn. *Fl. Brit. Ind. II*, p. 581. Vern. *Anar* (Pomegranate).

A small tree, often armed. Leaves opposite or clustered, oblong or elliptic, entire. Flowers axillary, solitary or in clusters, sessile, large, orange-coloured. Calyx-tube funnel-shaped, adnate to the ovary below. Stamens many. Ovary with many cells in 2 whorls, ovules many, either on parietal placentas or axile. Fruit berry.

Flowers chiefly in April and May.

XXXVIII. ONAGRACEAE

Jussieuia repens, Linn. *Fl. Brit. Ind. II*, p. 587.

Aquatic herb with floating stems and leaves. Leaves alternate entire. Flowers yellow or white, solitary axillary. Pedicels as long as the capsule. Capsule linear, angular, $\frac{1}{2}$ -1 $\frac{1}{2}$ " long.

Flowers during rainy season.

Jussieuia suffruticosa, Linn. *Fl. Brit. Ind. II*, p. 587.

An erect perennial herb. Leaves 2-3" long. Flowers stalked. Sepals 4, Petals 4, yellow. Stamens 6. Ovary inferior, 2-celled. Capsule 1-2" long, linear, cylindric.

Flowers during the rainy season.

**Trapa bispinosa*. Roxb. *Fl. Brit. Ind. II*, p. 590. Vern. *Singhara*.

Aquatic herb. Stem submerged. Leaves floating, alternate. Petiole with a spongy dilatation at the base. Flowers

axillary, peduncled. Petals 4, white. Stamens 4. Ovary 2-celled, solitary ovule in each cell. Fruit ovoid with 4 angles, berry, with 2 spines.

XXXIX. SAMYDACEAE

Casearia tomentosa, V. Roxb. *Fl. Brit. Ind. II*, p. 593. Vern. *Chilla*.

A small tree. Leaves alternate, petiolate, entire. Flowers small greenish yellow. Calyx 4-5 lobed. Petals 0. Stamens 8, Ovary 1-celled, 3 parietal placentas.

Flowers: March-May.

XL. PASSIFLOREAE

***Passiflora suberosa**, Linn.

Is seen growing in the gardens. It is a twining shrub with simple leaves and very characteristic hanging flowers.

***Carica papaya**, Linn.

The papaw is commonly cultivated and is more or less naturalised in various parts of India. It has unisexual flowers, generally on separate plants.

XLI. CUCURBITACEAE

Melothria maderaspatana, Cogn. *Fl. Brit. Ind. II*, p. 623.

A prostrate annual with angular hispid stem. Leaves 3-5 lobed, serrate, very tough, tendrils simple. Fruit small globose, bright red when ripe.

Bryonia lacinosa. Naud. *Fl. Brit. Ind. II*, p. 622.

Climbing annual herb. Tendrils 2-fid. Leaves 5-lobed petiole as long as the blade. Flowers yellow, fruit spherical green with white longitudinal stripes, $\frac{3}{4}$ " across.

Below is given a list of those genera which are cultivated for fruits.

They are eaten either raw or as vegetables.

- ***Trichosanthes anguina**, *Linn. Fl. Brit. Ind. II, p. 610.* Vern. *Chachinda*. (Snake gourd).

Fruit 1-3 ft. in length and much contorted.

- ***Trichosanthes dioica**, *Roxb. Fl. Brit. Ind. II, p. 609.* Vern. *Palwal*.

Flowers white, fruit 2-3½" oblong or nearly spherical, smooth, orangered when ripe.

- ***Lagenaria vulgaris**, *Ser. Fl. Brit. Ind. II, p. 613.* Vern. *Lauki* or *Ghiya*.

Flowers large white. Fruit bottle or dumb-bell-shaped.

- ***Luffa aegyptiaca**, *Mill. Fl. Brit. Ind. II, p. 614.* Vern. *Ghiya torai*.

Flowers yellow, fruit smooth, not ridged.

- ***Luffa acutangula**, *Roxb. Fl. Brit. Ind. II, p. 615.* Vern. *Kali torai*.

Flowers yellow. Fruit smooth, sharply 10-ridged.

- ***Benincasa hispida**, *DC. Fl. Brit. Ind. II, p. 616.* Vern. *Petha*.

Flowers large yellow. Fruit large 1-1½ ft., fleshy, oblong indehiscent, covered with a waxy bloom.

- ***Memordica charantia**, *Linn. Fl. Brit. Ind. II, p. 616.* Vern. *Karela*.

Flowers yellow. Fruit 1-5" long ovoid, longitudinally ribbed with rows of triangular tubercles.

- ***Cucumis melo**, *Linn. Fl. Brit. Ind. II, p. 620.* Vern. *Kharbuzā*. (The melon).

Flowers yellow. Fruit fleshy spherical, ovoid, smooth.

- ***Cucumis melo**. Var. *utilissimus*. *Duthie. Field and Garden.* Vern. *Kakri*.

Fruit cylindrical.

***Cucumis melo**, Var. *Momordica*. *Duthie. Field and Garden*.
Vern. *Phunt*.

***Cucumis sativus**, *Linn. Fl. Brit. Ind. II*, p. 620. Vern. *Kbira*.
Fruit elongate smooth.

***Citrullus colocynthis**, *Schrad. Fl. Brit. Ind. II*, p. 620. Vern.
Indryan.

Flowers yellow. Fruit globose upto 3" in diameter, intensely bitter.

***Citrullus vulgaris**, *Schrad. Fl. Brit. Ind. II*, p. 621. Vern.
Tarbuṣ.

Fruit globose upto 10" in diameter, fleshy, juicy, very sweet.

Coccinia indica, *W. and A. Prod. Duthie. Fl. Upper. Gang. I*,
p. 375. Vern. *Kundru*.

Climbing herb. Tendrils simple, leaves toothed. Flowers white. Fruit ovoid or oblong, bright scarlet.

***Cucurbita pepo**, *Linn. Fl. Brit. Ind. II*, p. 622. Vern. *Kashiphal*
or *Kaddu*. (Pumpkin).

Flowers yellow. Fruit fleshy large.

***Cucurbita moschata**, *Duchesne, Fl. Brit. Ind. II*, p. 622.
(Sweet Pumpkin).

XLII. BEGONIACEAE

Begonia, *Linn.*

Succulent herbs. Stem rhizome. Leaves alternate, unequal-sided, toothed. Stipules 2, free, deciduous. Flowers showy, unisexual. Male flowers of 4 perianth, 2 outer valvate, sepaloid, bigger, 2 inner smaller. Stamens many, free or one-adelphous. Female 2-5 segments. Ovary inferior, 2-3-4-celled placentation axile, ovules many.

Many species are cultivated during the winter season.

XLIII. CACTACEAE

Opuntia dillenii, *Haw. Parker. Forest Flora of Punjab*, p. 264.

Succulent herbs or shrubs. Joints 12-16" by 6-8", broadly obovate, undulate, bluish-green. Prickles in tufts of 4-6 in areoles. Flowers yellowish tinged with orange, outer perianth segments ovate, acute, rounded, the inner obovate. Stamens many unequal. Ovary inferior 1-celled, 3 or more parietal placentas, ovules many, stigmas 3 or more, lobed. Fruit a berry.

Flowers: April-June.

Cereus pterogonous, *Lemaire. (fide Burkill). Parker. Forest Flora of Punjab*, p. 260.

Erect, arboreus, 12-15 ft. high, branches erect, parallel, bluish-green, 4-7-ribbed, later becoming angular and finally rounded. Ribs compressed, undulate, 1-2" high. Prickles about 8 in each tuft.

Flowers white, during the rainy season. It makes an excellent hedge.

XLIV. FICOIDEAE

Trianthema, *Linn.*

Diffuse prostrate herbs. Leaves petiolate, opposite, unequal ovate, entire, succulent, petiole connected at the base by their dilated membranous margins. Flowers small axillary, solitary. Calyx-lobes 5. Petals absent. Stamens 5-10 inserted at the top of the calyx-tube. Ovary 1-2 celled. Styles 1-2. Ovules 1-many, basal. Capsule circumsciss, the upper portion often carrying away 1-2 seeds.

Trianthema monogyna, *Linn. Fl. Brit. Ind. II, p. 660. Vern. Patharchatta.*

Leaves $\frac{1}{2}$ -2 $\frac{1}{2}$ ". Flowers solitary. Stamens 10 or more. Ovary 1-celled, many ovules. Style 1.

Trianthema crystallina, *Vahl. Fl. Brit. Ind. II*, p. 660. Vern. *Pathar phor*.

Small herb. Leaves $\frac{1}{2}$ - $\frac{3}{4}$ ". Stamens 5. Style 1. Capsule $1/12$ ", 2-seeded.

Mollugo hirta, *Thumb. Fl. Brit Ind. II*, p. 662.

A densely hairy annual. Stem prostrate, spreading. Leaves alternate, falsely whorled, hairy. Flowers in axillary clusters. Sepals stellate-hairy. Petals absent. Stamens 10 or more, staminodes present. Styles 3 or 5. Capsule oblong shorter than the sepals.

XLV. UMBELLIFEREAE

***Coriandrum sativum**, *Linn. Fl. Brit. Ind. II*, p. 717. Vern. *Dhanya*. (Coriander).

Glabrous annual. Leaves simple much dissected with sheathing base. Compound umbel. Involucre of bracts absent, involucels few, filiform. Calyx-teeth small often unequal. Outer flowers zygomorphic and inner actinomorphic. Petals obovate, emarginate, white or purplish. Outer petals of the outer flowers larger and lobed, unequal. Fruit subglobose.

Flowers during the winter season.

***Peucedanum graveolens**, *Linn. Fl. Brit. Ind. II*, p. 709. Vern. *Sowa*.

Glabrous annual. Leaves much divided and ultimate lobes linear. Compound umbel. Flowers yellow. Fruit much dorsally compressed, ellipsoid, oblong.

***Daucus carota**, *Linn. Fl. Brit. Ind. II*, p. 718. Vern. *Gajar*.

XLVI. CORNACEAE

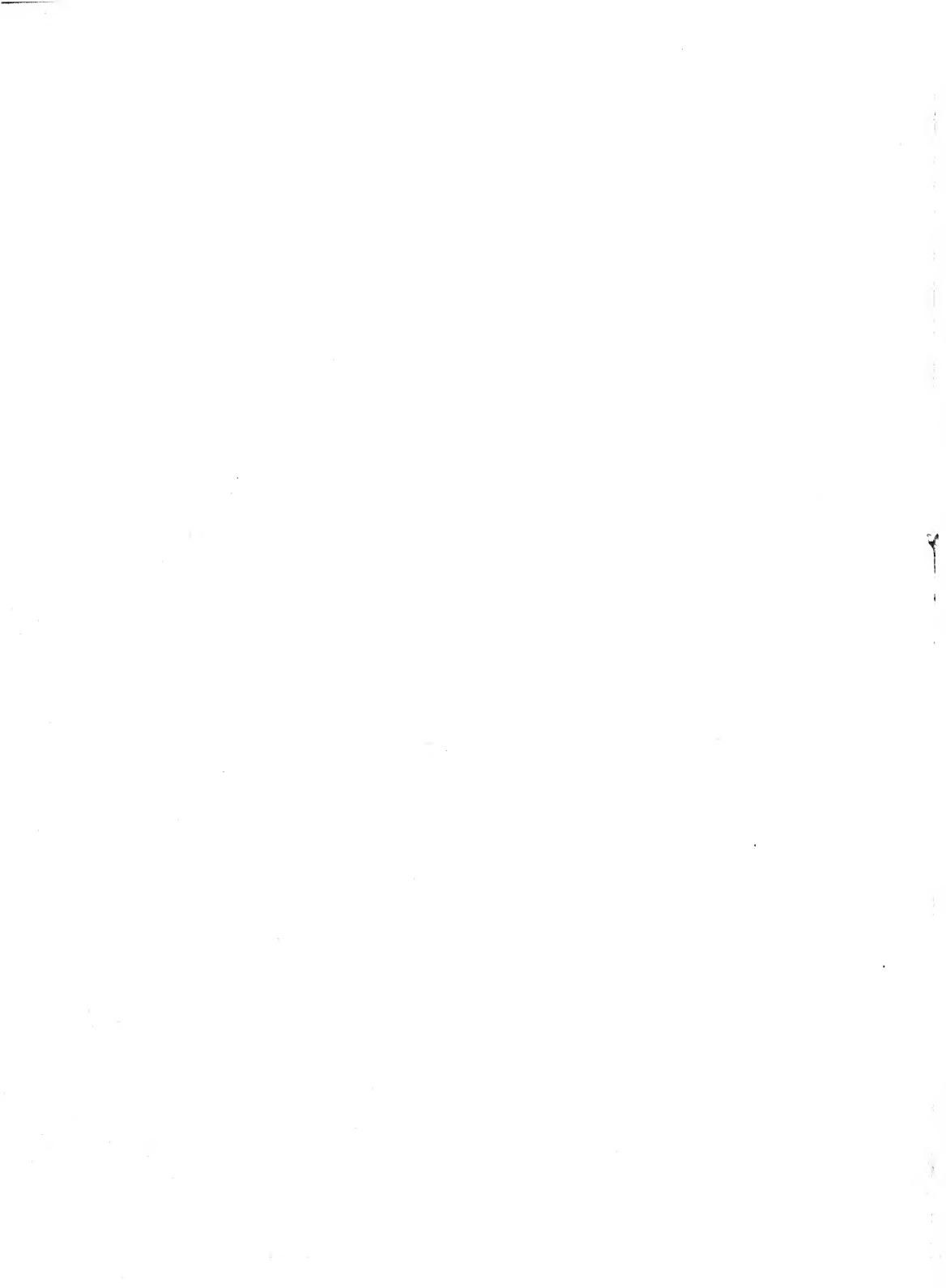
Alangium lamarkii, *Lamk. Fl. Brit. Ind. II*, p. 741.

A shrub often spinescent. Young parts woolly. Leaves 3-6 alternate, unequal, round at the base. Flowers white, fragrant. Calyx-teeth minute. Petals 6-7, lanceolate. Stamens many. Ovary 1-celled. Fruit a berry.

Flowers: February-April.

In conclusion the author acknowledges his indebtedness to Professor J. H. Mitter for his helpful suggestions.

SECTION III
ZOOLOGY



ON THE CYTOPLASMIC INCLUSIONS IN THE OOGENESIS OF LEPUS CUNNICULUS

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INTRODUCTION

Research work on the cytoplasmic inclusions in the oogenesis of mammals, especially in the light of modern cytology, is limited in number and quantity. The only recent researches along this line are those of Nihoul (28), Gatenby (16), O. Vanderstrict (38) and Gresson (18).

The work on mammals was therefore taken up by me in this laboratory in order to throw more light on the oogenesis of certain mammalian types commonly found in this part of India.

In a previous paper I described the oogenesis of the squirrel, *Sciurus palmarum* (12), which is commonly found here throughout the year.

The present paper on the rabbit describes the cytoplasmic inclusions in the oogenesis of this animal, and also deals with follicular atresia, development of the graffian follicle and zona pellucida, which have been studied carefully along with the inclusions.

The "Infiltration theory" of Brambell and Bhattacharya, which has been verified by many workers in this laboratory, both on vertebrate and invertebrate material, affords interesting study in this animal.

The present investigations were carried out in the Zoological Laboratory of the Allahabad University and I have pleasure in thanking Dr. Bhattacharya for his kind guidance and help. I am also indebted to Dr. Ram Saran Das for kind criticisms.

MATERIAL AND TECHNIQUE

The work on this animal was mainly carried on during the winter months. These cold months were favourable for fixation and section cutting.

The ovaries, as in the case of the squirrel, are compact and cylindrical and are attached to the body wall by connective tissue. They vary in length from 5 m.m.—9 m.m., with the age of the animal.

As the ovary is such a compact structure, it was cut up into very small pieces in salt solution and then placed in the desired fixatives. This facilitated the penetration of the fixatives and also made dehydration easier.

As regards fixatives, the usual laboratory methods were applied. For the demonstration of Golgi bodies, Cajal, Da Fano and Ludford's latest modification of Mann-Kopsch were used. Excellent results were obtained with all these fixatives especially with Da Fano which gave very good impregnation. Silver slides were toned in the usual way with gold chloride and hypo. Ludford slides were bleached with potassium permanganate and oxalic acid to enable the study of Golgi bodies and yolk. Da Fano slides were studied, toned and unstained and also after staining with safranin and light green. The only advantage in using this combination of stains was that it brought out the nucleus clearly into view and one could easily distinguish younger and older eggs where the nucleus occupies a definite position in the cytoplasm. For the study of mitochondria Regaud-Tupa and Champy gave excellent results. Zenker-Helly was tried, but gave poor results. The slides were best stained with acid fuchsin after differentiating with toluidine blue and aurantia. Precautions were taken to avoid overstaining with acid fuchsin in which case the cytoplasm becomes dark pink and thus the contrast effect of the stained mitochondria does not come out so effectively. Iron alum haematoxylin

was also tried. Bouin's picroformol method as given in Bolle's Lee seemed almost indispensable for the study of general structure and the nucleus and nucleolar extrusions. The slides were stained with Mann's methyl blue eosin and also with eosin and haematoxylin. The latter gave very good results. The sections were cut from 4-6 μ in thickness.

OBSERVATIONS

A. General Structure of the Ovary:—As mentioned previously the ovary is very compact. A transverse section reveals that a thick capsular or cortical connective tissue layer (Pl. 2 Fig. 12, Cor. C. T.) bounds the entire ovary, while the medullary region of the ovary consists of a stroma of closely set polyhedral interstitial cells (inters. C. Fig. 12). These two together give the ovary its compact nature.

The earliest oocytes are all produced in the cortical connective tissue, which may be looked upon as the germinal region. (Pl. 2, Fig. 12, OOC₁ OOC₂) shows early oocytes embedded in this connective tissue layer. Even in the advanced one-layered condition of the follicle the oocytes are embedded in this region. With growth the eggs are pushed inwards into the ovary, but still occupy a peripheral position.

Atretic follicles:—Engle (15) in his study of the follicular atresia in the mouse divides atretic follicles into two general types. Type 1 refers to the small primary follicle of 2-6 or 8 rows of cells in the granulosa but in which the antrum folliculi has not been formed. Type 2 refers to all follicles which have an antrum. In type 1 the usual signs of degeneration are to be found in the ovum itself which has spindles and polar bodies as described by Kingery in mouse. Others have gone through a type of division of fragmentation giving rise to a many-celled morula stage in which the zona may or may not be present. These conditions have been studied by Kingery in mouse, and by Loeb (24) in guinea pig.

In the case of rabbit I did not observe the former type i.e. type 1 but did observe a very common type of atresia in oocytes with one to two rows of follicle cells. The egg had degenerated, its zona pellucida was crumpled and distorted and follicle cells were proliferating and travelling into the egg (Pl. 3, Fig. 34). Engle states that atresia in follicles of type 2 which have an antrum differ in many respects from those of type 1. The granulosa may be so greatly degenerated as to leave only a few compressed rows of cells, a naked ovum being within the liquor folliculi where it undergoes cytolysis. In the greater number of cases the granulosa may have a normal number of rows of cells, but the antrum contains a great number of cells with pycnotic nuclei. These pycnotic cells are definite signs of degeneration. An ovum in a normal granulosa may exhibit cytoplasmic or nuclear changes.

In the rabbit, atretic follicles of type 2 were seen. In one case I observed a degenerate graffian follicle in which the membrana cells were very irregular and compressed. The theca externa and theca interna were abnormal. An antrum was seen on one side of the egg. This contained a number of small cells and the ovum was very much elongated (Pl. 3, Fig. 36.)

Abnormalities in the Ovary:—In one particular case the mature graffian follicle had ruptured on the inner side of the ovary into stroma, instead of going outside to the exterior (Pl. 3, Fig. 27). The liquor folliculi (foll. f) and the ovum seemed to pour into the stroma. This was probably due to the fact that the outer connective tissue layer of the ovary was too resistant, hence a rupture occurred on the inner side. Such abnormalities are uncommon and do not usually occur in this animal.

Corpus luteum:—This was observed in some ovaries. The infolding of the walls of the graffian follicle were visible and also the large luteal cells.

B. *The egg membranes and their development*

The mature egg of the rabbit is well protected and lodged within a graffian follicle. The latter in the mature condition occupies a considerable space in the ovary. This is due to the fact that it becomes distended with a large amount of follicular fluid or liquor folliculi (Pl. 3, Fig. 27, foll. f) which surrounds the ovum.

The egg membranes consist of a theca externa, theca interna, a follicle or membrana granulosa and a zona pellucida; the last named immediately invests the ovum. The theca externa is the outermost covering. It consists of strands of connective tissue fibrils (Pl. 3, Figs. 24, 25, Th. Ex.) which shade off into the cortical capsular connective tissue of the ovary, from where they probably originated. The theca interna (Pl. 3, Figs. 24, 25, Th. Int.) consists of three or four layers of large cells, usually rectangular in shape, which have their long axes in the circumference of the follicle.

Next to the theca interna, on the inner side is a single row of long spindle-shaped cells, arranged so that their long axes are in the circumference of the follicle (Pl. 3, Figs. 24, 25, Sp. C. Z.) These form a base for the granulosa and are regarded by many workers as the membrana propria.

The membrana granulosa in the mature follicle usually consists of layers of eleven to twelve rows of cells. The cells nearest the spindle cell zone of the membrana propria are columnar and found in two layers (Pl. 3, Figs. 24, 25, Col Gr). The remaining cells are polyhedral (Pl. 3, Fig. 24, memb. gr.). By the usual staining reagents the cytoplasm of the cells appears to form a syncytium.

Development of the follicle:—In this animal I could find practically all stages of the developing follicle and this made it very convenient to trace all the stages of the egg in its growth.

The youngest oocytes are naked and are lodged in the

cortical capsular connective tissue of the ovary (Pl. 2, fig. 12, OOC₁, OOC₂). (Pl. 1, fig. 1) shows a stage where the follicle has just made its appearance between the connective tissues and the oocyte. The cells are rectangular and evenly arranged. Inter-cellular spaces appear between the single row of cells (Pl. 1, fig. 3, Int. C. Sp.). These spaces widen as growth proceeds and finally appear as in fig. 5, int. C. Sp. Pl. 1. and fig. 14, Pl. 2. The follicle remains single-layered for a considerable length of time, in fact till the zona pellucida has been sufficiently developed.

At a later stage the nuclei of the single layered follicle begin to divide and since they are too many to lie in one row they are displaced so that one nucleus lies above another, thus a double layer results (Pl. 2, fig. 15). The theca interna is formed at a stage when the follicle is changing from the two to three-layered condition. It is of rapid formation and continues to remain as such till the mature stage is reached.

At the stage where the follicle is three-layered, the theca externa is also present and consists of connective tissue fibrils which were probably present in the cortical connective tissue of the ovary.

As growth proceeds the follicle, or membrana granulosa, as it may now be called, becomes several layered. Large spaces begin to appear in between the granulosa cells which become filled with fluid. With maturation the follicular spaces widen and the follicle becomes distended with liquor folliculi (Pl. 3, figs. 24, 25 foll. Sp.). In some cases the membrana granulosa becomes so reduced in size owing to the large amount of fluid that it appears as though the egg is suspended to the parietal granulosa by strands of cytoplasm (Pl. 3, fig. 27.)

Zona pellucida and its development :—The zona appears as a thick clear, jelly-like substance, enveloping the cytoplasm. It is well preserved in Bouin (Pl. 3, fig. 25, Z. P.), though it appears very much shrivelled up in osmic and some other preparations. No radial striations were present as in some other mammals.

As regards the development of the zona, it begins to be formed at the one-layered stage of the follicle i.e. when the follicle cells are not very large. A thin wavy membraneous structure is seen lying between the follicle and the egg (Pl. 1, fig. 2, Z. P.). (Pl. 1 fig. 3 Z.P.) is a later stage of development when the zona has grown a little thicker and fine intercellular spaces (Int., C. Sp.) are seen in close contact with it. The fact becomes clearer when we find that the infiltrating Golgi bodies of the follicular epithelium appear as a beaded chain (B.C. Gb.) in the intercellular spaces and this chain is continued into the zona, thereby showing that the intercellular spaces are continued into the zona. While the follicle is still one-layered the zona suddenly grows in thickness acquiring two-layers, an outer denser and narrower zone (O. L. Zp. Pl. 1, fig. 4) and an inner clearer transparent zone (Pl. 1, fig. 4 l. L. Z. P.). With growth the outer denser area encroaches on the inner and finally in older stages the zona consists entirely of the denser material.

C. Golgi bodies and their infiltration from the follicular epithelium to the egg.

Previous workers on mammalian oogenesis have found the Golgi apparatus, occupying a juxtannuclear position. The Golgi apparatus as seen by these workers appears in the form of a net-work or may consist of grains or battonets forming a compact mass.

This compact mass eventually fragments and passes to the periphery. This condition was also found by me in the squirrel (12).

In the animal under investigation, the juxtannuclear Golgi apparatus was not seen in either Da Fano or Ludford preparations.

A very interesting feature was the infiltration of Golgi bodies from the epithelium to the egg. This phenomenon was observed very satisfactorily in both Da Fano and Ludford pre-

parations. It exists in practically all stages of development i.e., from the stage where the follicle has just made its appearance to the mature stage of the egg.

There appears to be periodical activity in the follicle. At times the follicle becomes very active producing a large number of Golgi bodies and at other times it is less so, although infiltration still takes place. (Pl. 1, fig. 1) is an early stage of the oocyte where the follicle has just made an appearance. The cells of the follicle contain Golgi bodies which are seen infiltrating into the egg at places. (Inf. Gb.). Infiltration is not very active at this stage. Figs. 2 and 3 are oil immersion diagrams and show older stages where the zona pellucida (Z.P.) has just made its appearance. Infiltration is seen at these stages.

Figure 3 shows the Golgi bodies passing into the egg through intercellular spaces of the follicle cells in the form of a beaded chain B. C. Gb.

Figure 4 is a stage where the one-layered follicle cells have grown in dimensions. Infiltration is very active at this stage. The Golgi bodies prior to infiltration collect in patches towards one side of the follicle cells, close to the zona. They infiltrate into the egg via the zona in a haphazard fashion. At this stage the zona consists of an outer denser zone (O. L. Zp.). The Golgi bodies collect in large numbers in the outer zone giving the region a dense black ring-like appearance. At places the Golgi bodies are seen passing through the inner layer of the zona into the cytoplasm.

Figure 5 shows a stage where infiltration is less active and there are few Golgi bodies in the follicle probably due to the fact that in the previous stage most of them had infiltrated. A peripheral rim of Golgi bodies is present in the egg (Perip. r. Gb.) and it appears as though the rim which was formerly present in the zona has been pushed inwards into the cytoplasm. At certain places the Golgi bodies of this rim seem to spread inwards into the cytoplasm.

Figure 7 shows a stage where the follicle is two-layered and there is very great activity in the follicle as well as in the egg. A large number of Golgi bodies are present in the follicle; possibly these are new ones. The Golgi bodies in the upper layer of the follicle i.e., the layer further away from the egg, collect at the base of the cell, from where they pass into the layer nearer the egg and there collect in patches close to the zona at one corner of the egg (P. Gb.). They are present in the zona and pass into the egg in a haphazard fashion. The Golgi bodies already in the egg disperse in patches (D. P. Gb.)

Figure 6 shows a Ludford preparation where the follicle is two layered. The cell-membranes are not so clear owing to the action of the fixative. Patches of Golgi bodies are present in the follicle prior to infiltration.

Figure 9 is a stage where the theca interna has made an appearance and the follicle or membrana granulosa as it may now be called is three-layered. Infiltration takes place through all the four membranes of the egg, i.e., from the theca externa, theca interna, membrana granulosa and zona pellucida. The Golgi bodies originally present in the egg disperse in the cytoplasm.

Figure 11 shows a stage where the follicle or membrana is 4-5 layered. Infiltration is fairly active and is seen taking place from the theca to the membrana and also from membrana to zona and to the egg. The Golgi bodies in the cytoplasm of the egg at this stage show a decided decrease in activity. They are few, fine and granular and are present in between vacuoles which are found in the cytoplasm (Gb.) A corresponding stage (figure 8) was observed in Ludford where the follicle was about 4-5 layered. Infiltration was active. The Golgi bodies prior to infiltration were collected in patches. Owing to the action of the fixatives the follicular cell boundaries were not so distinct in Da Fano. The zona was full of Golgi bodies which were infiltrating haphazardly into the egg. The egg contained Golgi

bodies which were few and granular. The number of swollen Golgi bodies was large and Golgi yolk bodies were also present. It was the latter that did not fix in Da Fano and left vacuolar spaces.

Figure 25 (Plate 3) depicts a stage where the egg is fully mature and the nucleus is at the germinal vesicle stage. Infiltration ceases at this stage.

To sum up, infiltration is a marked feature of oogenesis in this animal and exists in all stages of the developing egg with the exception of the last stages of the mature egg. Large instalments of Golgi bodies are extruded into the egg at certain periods owing to the periodical follicular activity. Golgi bodies prior to infiltration collect in patches close to the zona. Their mode of infiltration is haphazard. Infiltration takes place through all the membranes of the egg as they get formed.

D. Mitochondria

Among formalin fixatives I found Regaud-Tupa very successful and practically all stages of the developing egg showing mitochondrial development could be seen in slides prepared from ovaries fixed in this fixative. Acid fuchsin stain proved better than iron alum and haematoxylin. Among chromosome fixatives, Champy was quite successful.

The earliest oocyte that could be seen is shown in Plate 2, figure 12 OOC₁. The oocyte at this stage is very small and embedded in the connective tissue. Three mitochondrial patches are seen, of which one is dense and juxtanuclear. This is the yolk nucleus of Balbiani. The other two are dispersed patches of mitochondria. An earlier stage than this could not be found.

Figure 12, OOC₂, shows a later stage, though still without a follicle. The mitochondria are found in distinct patches arranged about the periphery (perip. r.m.).

Figure 13 is a stage where the follicle is one layered in its early development. The mitochondria in the oocyte are peripheral and in distinct patches. They appear as pink dust-like particles crowded together on a denser area of the cytoplasm. The follicle also contains patch-like formations of mitochondria. At some places a few mitochondria are seen infiltrating into the egg (Inf. M.).

Figure 14 is a later stage where the one layered follicle has grown and the intercellular spaces are very large and wide. The peripheral condition of the mitochondria still persists (Perip. r.m.).

Figure 15 is a stage where the follicle is dividing up into a double layered condition. The peripheral rim of mitochondria (perip. r.m.) is quite wide and is seen spreading inwards into the cytoplasm. The characteristic mitochondrial patches are quite prominent. At about this stage the infiltration of mitochondria from the follicular epithelium to the egg is a very pronounced feature.

Figure 19 shows an oil immersion study. The follicle, close to the zona contains patches of mitochondria. Similar corresponding patches are found in the oocyte, and the zona in between is choked full of mitochondria.

When the egg is double-layered it is found that the mitochondria are evenly dispersed in the cytoplasm in patches. Most of the mitochondria have swollen up (S.M.) and yolk bodies (M.Y.) are also visible.

E. Yolk

The ova of this animal contains a fairly large amount of yolk, in spite of the fact that it is a mammal. Two distinct types of yolk are present; the Golgi or fatty yolk and the albuminous or proteid yolk. The former is seen in Ludford slides and goes deep black, the latter is seen in Regaud-Tupa,

Champy and in Bouin slides.

Fatty yolk or Golgi yolk arises at a stage when the follicle is 4-5 layered (Pl. 1, fig. 8, G.y.) as mentioned before. Various stages of development of Golgi yolk spheres can be observed from a tiny Golgi element to fairly large spherical structures (Pl. 1, fig. 8, S. G.b. Pl. 2. figs. 21 and 22 G.y.). The yolk bodies are fairly resistant and are not washed away so easily as fat globules are. In a slide slightly over-bleached by turpentine it was found that the yolk bodies which were washed away left behind vesicles and crescents with an osmiophilic rim and a central chromophobic part, thus confirming the view that they were derived from Golgi bodies (Pl. 2, figure 23, Gv. G. cr.). A Golgi body during its conversion into yolk swells up and deposits fat in its chromophobic portion. Fatty yolk formation continues to take place till the egg is mature. The yolk has a tendency to collect at one pole of the egg.

Plate 2, figure 21, shows a stage where the follicle is 5-6 layered and the yolk bodies are settling down towards one side.

Plate, 2, figure 22, represents another older stage showing large yolk bodies definitely collected at the nuclear pole. In fact, when the egg is mature and its nucleus has shifted to the periphery the fatty yolk is seen crowded up near the nucleus.

It has been observed in Da Fano slides that when the follicle is 4-5 layered, definite vacuoles are present. These take the place of Golgi or fatty yolk which has not been fixed (Plate 1, figure 11 V). The Golgi bodies are seen in a granular form in between these vacuoles (Gr. Gb.). They tend to become smaller as the egg matures till finally in the mature egg they practically disappear. This is due to the fact that most of them are used up in the formation of yolk.

Fatty yolk formation of this kind was found by me also in the squirrel (12). It has not been described in mammals by previous workers.

Albuminous or proteid yolk is fairly plentiful. It arises

when the follicle is double layered and after the mitochondria have fully dispersed in the cytoplasm (Pl. 2, fig. 18). Albuminous yolk here is of two kinds, (1) purely mitochondrial and (2) cytoplasmic formed under the influence of mitochondria. The former is formed by the mitochondria directly swelling up into yolk. Pink bodies like the mitochondria were visible in patches in Regaud-Tupa and Champy slides after staining with acid fuchsin (Pl. 2, figs. 16, 18). They were of varying sizes though not as large as fatty yolk. The smaller ones were swollen mitochondria (S.M.) and the larger ones mitochondrial yolk (M.Y.). It was also observed that occasionally a single mitochondria is lodged within a vacuole (Pl. 2, figs. 18 and 20). The mitochondria within these vacuoles swell up to almost double the normal size and form yolk spheres.

In some of the sections it was observed that mitochondria encircled vacuoles in a very definite manner (figs. 18 and 20). In older stages of the egg a fairly large amount of proteid yolk is present (Pl. 2 fig. 17 M.Y.)

F. Nucleus and Nucleolar Extrusions

I found Bouin slides very successful for the study of the nucleus and its extrusions. Extrusions were also seen in other fixatives such as Champy and Regaud-Tupa. In the young oocytes which are without a follicle, the nucleus is large and occupies a central position. Its contents consist of a network of chromatin and a number of nucleoli and nucleolar buds (Pl. 3, fig. 30.). No definite large nucleus was observed.

With the growth of the oocyte and at the one layered condition of the follicle it is found that a few nucleolar extrusions are visible in the cytoplasm (fig. 31 N.E.). There is a steady increase in activity from this stage onwards to the double layered condition of the follicle. At the stage where the follicle is double layered the nucleus of the egg is extremely active. Numerous nucleolar buds are visible which remind one of small strings of

beads. A number of nucleolar buds are also seen adhering to the nuclear membrane on its inner side. Besides this a number of bodies of a similar nature are found just outside the nuclear membrane suggesting that they have been extruded from the nucleus. In fact, the whole cytoplasm is studded with nucleolar extrusions which are often beaded and resemble the nuclear buds in the nucleoplasm (figs. 28 and 29 N. E.). It seems probable that these extrusions have been passed out through the nuclear membrane in solution and have been condensed in the cytoplasm immediately after extrusion for in no place did the nuclear membrane show any sign of a rupture.

Yolk bodies are visible and can be readily distinguished from the nucleolar extrusions, owing to the fact that they are round and occur isolated (Pl. 3, figs. 28 and 29 Y. B.). This is the most active stage of the nucleus. From this stage onwards activity decreases.

With the growth of the egg the nucleus moves towards the periphery and at the stage of maturation occupies a distinct peripheral position in the egg and is known as the germinal vesicle (Pl. 3, figs. 24, 25, 26 and Pl. 2, fig. 17 N.). This is characteristic of all Eutherian mammals. The nucleus becomes very vesicular and contains vacuoles (Pl. 2, fig. 17, N. V. and Pl. 3, fig. 26, N. V.) At this stage the nucleolar buds are few and in some cases six to seven nucleolar buds are seen scattered in the nucleus (Pl. 2, fig. 17, N. U.)

The nucleolar extrusions diminish in size and in number (N. E. Fig. 26, Plate 3). Vacuoles are seen in the cytoplasm M. V. which probably indicate the positions of fatty yolk which have not been fixed.

Nucleolar extrusions do not take any part in vitellogenesis and finally disappear in the cytoplasm. Nucleolar extrusions when found in Champy and Regaud-Tupa (Plate 2, Fig. 16 N. E.) could be very readily distinguished and were not confused with mitochondrial yolk.

OBSERVATION OF VITAL STAINING AND
CENTRIFUGE EXPERIMENTS

It was extremely difficult to examine this material *intra vitam* with or without stain. The ovary as mentioned previously is very compact owing to the capsular connective tissue and the stroma. The eggs are very well protected by the follicle. This makes it a difficult material for the penetration of vital dyes.

The experiments were more successful with younger ovaries which had less stroma and could be teased out with less difficulty.

The material was cut into very small pieces in physiological salt solution and placed in the required dyes. The usual Janus green B and neutral red were utilized. Osmic acid in combination with neutral red was also tried.

The eggs were first studied before staining. Small pieces of the ovary were teased out. The oocytes were visible though obscured by the rows of follicle cells. For the sake of convenience they were removed from the follicle by gently pressing and rubbing the cover-slip over the material on the slide. The oocytes were thus isolated and then studied. They are spherical and jelly-like with a wide *zona pellucida*.

The Golgi bodies are seen distinctly as discrete refractile bodies. The mitochondria are dust like and non-refractile.

Staining with Neutral Red.—Pieces of the ovary which had been immersed in neutral red solution were teased out on the slide. As the dye had not penetrated evenly, a drop of dilute neutral red was allowed to run under the coverslip, and individual oocytes were removed as in the previous case. After about 15-20 minutes patches of the vacuome appeared in the cytoplasm. At first small patches of the vacuome appeared and later the larger ones became prominently marked out Plate III. fig. 32.

Neutral red and osmic acid.—Very dilute osmic acid was utilized. It was prepared by adding a drop of 2% osmic in a large watch glass containing physiological salt solution. A drop of

this mixture was placed on neutral-red-stained material. After a short time the Golgi bodies were clearly seen with a dark osmophilic rim and central chromophobic portion. They appeared as vesicles and crescents and were distinctly separate from the vacuome. Large blackish bodies—the yolk bodies, were also seen Plate III. fig. 35.

Janus Green B.—As in the case of neutral red a drop of dilute Janus green B was allowed to run under the coverslip to the material which had been teased out. After about fifteen minutes, patches of mitochondria were visible. The mitochondria were stained green and were granular and rod-like in appearance.

Centrifuge.—These experiments were performed prior to vital staining and were carried out with the purpose of observing what effect centrifuge has on the vacuome and Golgi bodies. Small pieces of the ovary were placed in physiological salt solution and centrifuged at a speed of 3500 revolutions per minute for 2 hours. The pieces were then teased out and examined with neutral red and osmic acid. The former was used first. The vacuome made its appearance after about 15-20 minutes.

In some of the eggs it was observed that the vacuome had a tendency to collect at one side of the egg. With the addition of dilute osmic acid the Golgi bodies were stained in the characteristic way and apparently occupied one pole of the egg. The layers though distinctly present showed that the material needed to be centrifuged for a much longer period in order to attain more convincing results.

DISCUSSION

The Egg Membranes

The Origin of the Zona Pellucida :—The origin of the Zona Pellucida has been the subject of much controversy. Those who have given detailed accounts of the mammalian zona pellucida may be grouped into three classes.

1. Those who regard it as originating from the egg cytoplasm.

2. Those who maintain it is derived from processes of the egg epithelium or from an exoplasmic or intercellular substance of the cells of the epithelium.

3. Those who state its origin to be uncertain. Van Beneden, Kolliker, Sobotta belong to class I. Van Beneden (37) supports this view because of the fact that in normal follicles of bat, the egg cells are in close contact so that the zona of one touched the zona of another to the exclusion of the epithelial layer.

Other workers like Flemming, Retzius, Von Ebner state that the zona is formed of cytoplasmic prolongations of the epithelial cells.

Retzius (33) states that in the rabbit cylindrical cells send out branched processes, which gradually interlace so that a thick network originates round the egg. A consolidation occurs on the inner belt of this network forming the zona. In the completely developed zona pellucida the outer zona is also consolidated and between the inner zona and the surface of the egg, radiating striations can be recognised. Miss A. Thing (36) working on the zona pellucida of turtles states that during its growth it is formed of two or three different elements, (a) the fundamental homogeneous substance filling up the spaces in between, (b) a system of numerous canals or tubules, (c) filaments or prolongations of the epithelial cells which are connected with the surface of the egg. According to her it is most favourable for the conveyance of nutritive material. Gatenby working on *Ornithorhynchus* shows that the pre-zona substance begins to form at a stage when the follicle changes from the one-layered to the double layered condition. He says that the pre-zona substance seems to be definitely formed by the follicle cells. Moreover till the last stage of development of the oocyte the follicle cells lie in close relationship with the zona

and when the egg is extruded the naked edges of the follicle cells are left supporting the view that the zona and the follicle cells were previously intimately related.

In this animal the zona makes its appearance at the stage when the single layered follicle has made its appearance and the follicle cells are not very large. Throughout the development of the zona there is a close relationship between it and the follicle cells, specially the intercellular spaces of the follicle cells and it seems as if the zona is of follicular origin.

*Golgi Bodies and their Infiltration from the Follicular
Epithelium to the Egg*

Before discussing the present findings on this material it would be well to review the work of some of the previous workers along this line.

Most of them believe that the Golgi apparatus exists in a juxtanuclear form in the young oocyte and later fragments, and passes to the periphery and ultimately it exists in the form of small particles distributed about the periphery.

Sjovall (35) was the first to state that the Golgi apparatus in *Cavia* was in the form of a hollow sphere situated at one pole of the nucleus. The sphere breaks up and the fragments pass to the periphery.

Rio Hortega (32) states that the Golgi apparatus of the guinea pig and rabbit is in the form of a network, occupying a juxtanuclear position. In older eggs the Golgi material occurs as a loose network of thick threads situated at the periphery.

Other workers such as Cattaneo working on guinea pig, rabbit and bat, Nihoul (28) working on rabbit, Gresson (18) on mouse agree with such old workers as Sjovall.

In the squirrel I found a similar condition of the Golgi apparatus as described by these workers but in the rabbit I did not observe the juxtanuclear Golgi apparatus, in either DaFano or

Ludford preparations. On the other hand, I found the infiltration of Golgi bodies from the follicular epithelium to the egg to be a very characteristic feature of oogenesis occurring at all stages of development i.e., when the follicle has just made an appearance and before the zona pellucida is established, to a stage where the egg is about to undergo maturation.

That granules could pass from the follicle cells into the egg is a very old idea. Waldeyer, Loyez and other authors have described the passage of granules into the egg.

In reptiles, Loyez emphasises that the large follicle cells furnish substances to the egg for the formation of yolk and these substances pass out by canal like processes and may be fluid, semifluid or granular.

Brambell (10) in the fowl was the first to observe the Golgi bodies infiltrating into the egg from the follicle cells. Bhattacharya (3) simultaneously observed the phenomenon in *Testudo graeca*. Since then several others have observed it in this laboratory in both vertebrates and invertebrates.

Among the vertebrates—fishes, reptiles, birds and amphibians, this phenomena has been dealt with by Bhattacharya, Das and Dutta (5) and also by other workers. Among the invertebrates it has been studied in such forms as *Periplaneta orientalis*, *Scylla*, *Appias*, etc.

In the rabbit the Golgi bodies of the follicle cells are extruded at all stages, though there is periodical activity and at times large instalments are infiltrated into the egg. The Golgi bodies like the nutrient material of Waldeyer and Loyez pass in a granular form and are eventually converted into yolk.

Brambell (10) observed in the fowl that the Golgi apparatus in the follicle cell divides into two and only one-half is extruded into egg. In the rabbit a large number of Golgi bodies were produced in the follicle cells periodically and these prior to infiltration collected in patches near the zona and filtered into the egg. Infiltration took place through all the membranes of the

egg as they made their appearance.

The mode of extrusion of the Golgi bodies from the follicle cell to the egg can be haphazard, or in the form of granules through distinct channels in the zona.

The latter has been observed in tortoises by Bhattacharya (3) and in a few mammals by P. R. Bhattacharya and also by me in squirrel (12). The only difference between tortoises and mammals was that a fibrillar layer was present in the former and absent in the latter.

In the haphazard mode of extrusion the Golgi bodies may be extruded in a granular form or they may pass in comparatively large lumps. The former was described in many animals both vertebrate and invertebrate. The latter was observed in the fowl by Brambell (10) and in *Uromastix* and *Calotes* by Bhattacharya, Dass and Dutta (5).

In this animal the mode of extrusion is definitely haphazard and the Golgi bodies are extruded as fine granules.

The extruded bodies of the follicle cells play a definite role in oogenesis and are converted into fatty yolk. As the egg matures the Golgi bodies become very granular and eventually disappear. In the mature egg all that is left of them is found in a peripheral ring.

There is difference of opinion as regards the morphological nature of Golgi bodies. Brambell and Gatenby have shown that the Golgi body in the nerve cells of *Helix* is in the form of curved rods or ring-shaped dictyosomes. Nath in a series of papers has shown that it is always vesicular with a chromophilic cortex and a chromophobic centre. Bhattacharya (3) has described various forms in tortoise such as crescents, rods and platelets.

In the material under investigation they existed in the form of vesicles, crescents and granules and were seen thus in fixed preparations as well as by *intra vitam* and after treatment with osmic.

Mitochondria

Vanhder Stricht in his review of the cytology of the mammalian egg (1923) shows mitochondria in all stages of the life of the ovum. During the period of growth of the oocyte the mitochondria are found to be in a fairly dense mass in and around the vitelline body of the yolk nucleus. As the oocyte grows larger, the mitochondria move away and are scattered throughout the cytoplasm.

A similar condition was found by the present writer in the rabbit. In the very early oocyte which is embedded in the cortical layer the mitochondria are aggregated near the nucleus in a dense area—the yolk nucleus of Balbiani.

It was found by workers of the Vanhder Stricht school and also by Levi (25) that during the later stages i.e. after the mitochondria have been dispersed evenly in the cytoplasm, they come to be at the margin of the egg and form a peripheral zona. Unlike the above workers it was found by me in the rabbit that a marginal zone existed in the younger egg. The marginal zone at these stages may be due to the fact that the infiltration of mitochondria occurs at these stages and a large number of mitochondria are introduced from the follicle into the egg. This is specially marked at the stage where the follicle is changing to the double layered condition. Consequently at this particular stage the marginal zone is full of mitochondria. At the stage where the follicle is fully double layered the peripheral zone spreads inwards and the mitochondria are scattered evenly in the cytoplasm.

The present investigations on this animal prove that mitochondria play a very definite and important part in vitellogenesis. They are found to give rise to yolk directly and also indirectly.

As regards the morphological nature of mitochondria they have been found to exist in various forms such as granules, rods and filaments.

In the rabbit they were found in the form of rods and granules and existed in platelets both in the younger as well as in the older eggs.

The infiltration of mitochondria from the follicle to the egg has been observed by Bhattacharya and K. B. Lall in tortoises (6). In the young eggs of the mouse, Gresson (18) has shown that the mitochondria are more numerous in the part of the cell next to the oocyte. He supposes that the mitochondria may take part in the formation of a secretion which is absorbed by the oocyte.

The present writer finds the infiltration of mitochondria active in the younger stages where the follicle is one-layered, and the stage where it is changing to the double layered condition. At the latter stage mitochondrial patches exist near the zona which is choked full of mitochondria.

Yolk

Yolk bodies are very plentiful in this animal. Yolk has been definitely divided by the present day cytologists into two kinds i.e. the fatty and the proteid or albuminous yolk.

Both these types of yolk were found in rabbit in a fairly large amount. Fatty yolk formation took place at a stage where the follicle was 4-5 layered and proteid yolk at a stage where the follicle was double layered.

As regards the formation of fatty yolk, Hirschler (20) was the first to describe the origin of fatty yolk from Golgi bodies. Since then Gatenby, Brambell, Nath, Bhattacharya have upheld this view. Nath has shown in a number of animals that fatty yolk arises from Golgi bodies which deposit free fat in the chromophobic part. In squirrel fatty yolk formation was very pronounced (12).

Gresson working on mouse (18) does not find fatty yolk in normal eggs but has described fatty bodies in atretic eggs.

In the rabbit under examination swollen Golgi bodies and

Golgi yolk bodies were visible in Ludford slides, and first made an appearance at a stage where the follicle was 4-5 layered. This fact was further confirmed by Dafano slides which showed eggs of the same stage where vacuoles were present in the cytoplasm. These vacuoles represented fat which did not fix. Besides this, vacuoles were also found in older eggs fixed in Bouin.

The Golgi origin of fatty yolk was further confirmed when Ludford sections were overbleached by Henneyguy's method. It was found that fatty yolk was partially dissolved leaving behind large vesicles and crescents. Then again it was observed by fresh coverslip preparations that fatty or Golgi yolk turned black after treatment with osmic. The mitochondrial origin of proteid yolk has been shown by many workers such as Hirschler, Gatenby, Nath, Bhattacharya and his collaborators, and previous workers on mammals have also observed it.

In this animal two types of proteid yolk are found viz. mitochondrial and cytoplasmic. The latter was apparently formed under the influence of mitochondria.

As regards the mitochondrial origin of proteid yolk Monteresso (26) describes alterations in the mitochondria of growing mammalian ova coincident with the formation of deutoplasmic granules which he interprets as indicating the formation of yolk by mitochondria.

In the rabbit under investigation, it was found that mitochondria directly gave rise to yolk. In some cases the mitochondria became swollen in the bare cytoplasm whereas in other cases they were found swelling up in vesicles and forming yolk.

The mitochondrial yolk as seen in Regaud-Tupa slides, stained with acid fuchsin were in no case confused with the nucleolar extrusions which also appeared alongside. The latter took up a definite darker stain like the nucleoli of the nucleoplasm.

The indirect role of mitochondria in vitellogenesis has been observed by many workers.

Russo (34) describes the formation of yolk in the cytoplasm where mitochondria definitely surround vacuoles and form yolk.

O. Vanhder Stricht (38) has shown that during the dispersal of mitochondria from the yolk nucleus stage to the stage of the marginal zone of the mitochondria, vacuoles are formed in the cytoplasm and these give rise to yolk.

Bhattacharya and K. B. Lall have shown in tortoises (6) that mitochondria surround vacuoles in which yolk is elaborated.

The present writer finds, that in rabbit definite vacuoles are formed in the cytoplasm. The mitochondria surround these and yolk is formed in them under the influence of mitochondria.

Nucleus and Nucleolar Extrusions

The nucleus in the young eggs of rabbit is large and central but moves towards the periphery as the egg matures. It becomes very vacuolated in the mature stage.

In the young oocytes a number of small nucleoli are seen stretched across on a meshwork of chromatin. No definite large nucleolus was observed at this stage.

Previous workers have described the nucleolus giving rise to buds. Gresson (18) has observed this in mouse. In the animal under investigation larger and smaller bodies were visible in the nucleus in younger eggs. It is likely that the smaller ones are nucleolar buds. In older eggs 5-6 nucleoli are present.

That nucleolar extrusions are found in the cytoplasm is a well established fact and has been observed by most of the prominent workers e.g., Gatenby, Ludford, Hogben, Nath and Bhattacharya, who have found them in a number of animals.

In rabbit, nucleolar extrusions are found in young stages but nuclear activity is very marked at the stage where the follicle is double layered. There seems little doubt that the bodies found in the cytoplasm in Bouin slides are nucleolar extrusions.

They have a striking resemblance to the bodies within the nucleus. Besides, these bodies are found lying very close to the inner side of the nuclear membrane and also outside the nuclear membrane i.e. in the cytoplasm, thus suggesting that the latter have been extruded.

The nuclear membrane did not show any sign of being ruptured at any place. It seems highly probable under the circumstances that the nuclear material was extruded in solution and condensed again on reaching the cytoplasm. This view has been held by Harvey in *Carcinus* (19) and by Gresson in mouse (18).

Nucleolar extrusions have been found to take part in vitellogenesis in various animals. Hertwig states that yolk is laid down by chromadial material extruded from the nucleus. Gresson (18) has shown that nucleolar extrusions definitely gave rise to yolk in oocytes of the mouse.

The present writer has not observed this in the rabbit although nucleolar extrusions were very plentiful.

Nucleolar extrusions diminished in number and in size as the egg matures and it is very probable that they are absorbed in the cytoplasm.

Vacuome

Much controversy still persists regarding Parat's vacuome hypothesis, which stated that the classical Golgi apparatus was an artefact and was produced by the precipitation of osmic or silver round about vacuoles, which were the real Golgi bodies. Parat's observations and conclusions were drawn from his work done on the salivary glands of the chironomus larva. Krjukowa (23) Beams and Goldsmith (2) reviewed the work on the salivary glands of the chironomus larva, and definitely found the typical Golgi bodies existing as crescents. These were explained by Parat as "chondriome actif", and the vacuoles as vacuome. Parat's vacuome hypothesis has been supported by

workers such as Covell and Scott and other workers on Protozoa such as Hall and his collaborators.

Many present day cytologists are now in total disagreement with Parat's hypothesis.

Beams (1) found the vacuome and Golgi bodies existing as independent structures in the same cell. Nath (27) has shown in the fresh eggs of Teleostean fishes that vacuome and Golgi elements are independent structures. The Golgi elements go deep black in osmic and the vacuoles are stained with neutral red.

Bhattacharya and Das (4) have found Golgi bodies and vacuome existing as independent structures. Many workers such as Gatenby, Hirschler, Monne, Voinov have found the vacuome and Golgi elements separate from each other.

In this laboratory workers on different animals both vertebrate and invertebrate have come to the conclusion that vacuome and Golgi elements are distinct and separate from one another. With regard to mammals, I found in the case of the squirrel that the Golgi bodies and vacuome were definitely separate structures. In the present investigation on the rabbit I found the vacuome and Golgi bodies existing side by side. The Golgi elements went black in osmic and the vacuome was stained with neutral red. Both these structures were seen simultaneously when a combination of osmic and neutral red was utilized.

Summary

1. The cell inclusions have been studied both by fixed preparations as well as by intra-vitam and vital staining experiments.

2. The ovary is compact, consisting of a medullary stroma of interstitial polyhedral cells and a capsular cortical connective tissue, in which the early oocytes are embedded and undergo their early development i.e. the formation of the one layered

follicle and its growth up to the formation of the second layer.

3. Atretic follicles are common. In the young follicles where the layers consist of one to two rows of cells the egg degenerates and the cells of the follicle proliferate into the egg. Atretic follicles with membranes show a degeneration of the follicle cells which are irregular and lose their polygonal shape. Eggs of such follicles are very much elongated.

4. Corpus luteum was seen. The walls of the graffian follicle undergo infolding and large luteal cells are present.

5. Egg membranes consist of a theca externa, theca interna, membrana granulosa and zona pellucida.

6. The development of follicle was carefully studied from the earliest stage to the mature stage.

7. The zona pellucida appears when the follicle is single-layered and the cells of the follicle are not very large. It appears as a membranous structure only observed with very high magnification. It lies in close contact with the follicle cells and the intercellular spaces of the latter. It grows rapidly in the early stages and consists of an outer denser, narrower region and an inner, broader, transparent layer. The outer encroaches on the inner, and in the older stages forms the substance of the zona. The zona in the mature stage of the egg is very broad and does not possess radial striation.

8. The juxtannuclear Golgi apparatus was not somehow, seen in either Dafano or Ludford preparations. Infiltration of Golgi bodies forms a predominating feature of oogenesis. It takes place from the earliest stages, as soon as the follicle makes its appearance i.e. before the zona is formed and continues till the egg is mature. It ceases when the egg is quite mature. Activity is greater at certain stages. The Golgi bodies prior to infiltration collect in patches near the zona. They are extruded in a haphazard fashion into the egg. The Golgi bodies which have been extruded into the egg disperse in the cytoplasm and are converted into yolk. They diminish in size and number as

the egg matures. In the mature stage only a peripheral rim of Golgi bodies remains.

9. Golgi bodies have a duplex structure i.e. an osmiophilic rim and a central chromophobic portion.

10. Mitochondria are concentrated in the very early stage in a juxtannuclear manner forming the yolk-nucleus of Balbiani.

11. The mitochondria are dispersed from the yolk nucleus of Balbiani stage and collect in patches forming a rim at the periphery of the egg. The peripheral rim of mitochondria persists till the stage when the follicle becomes double layered. At this stage the rim spreads inwards and the mitochondria are dispersed in patches in the entire cytoplasm.

12. Infiltration of mitochondria takes place when the follicle is single layered, but is very active at the stage where the follicle is changing to the double layered condition. The mode of extrusion is haphazard like the Golgi bodies.

13. Yolk is present in a fairly large amount. Two types of yolk are found; Golgi yolk and proteid yolk.

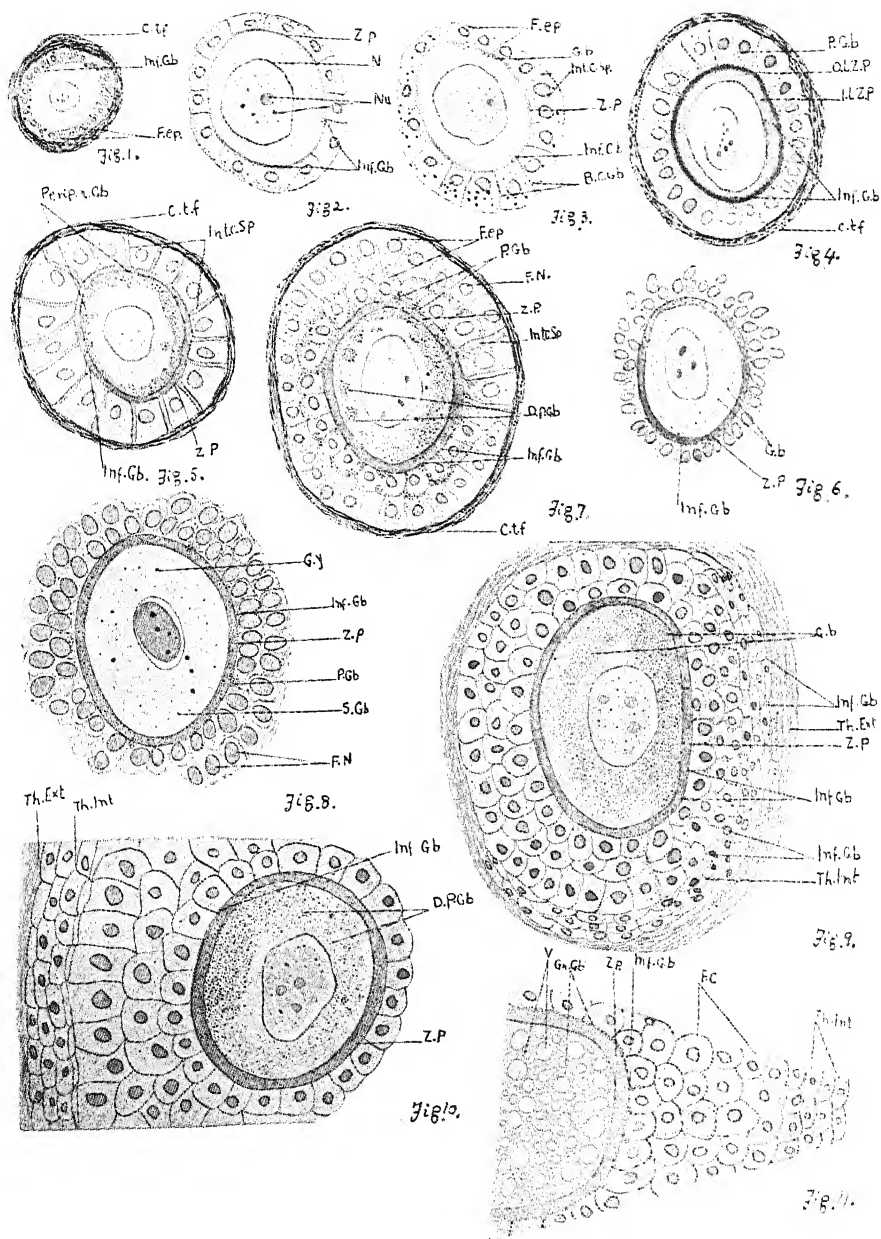
14. Fatty yolk or Golgi yolk begins to be formed when the follicle is 4-5 layered. Golgi bodies swell up and give rise to yolk as seen in Ludford slides whereas in Dafano slides vacuoles make their appearance at the corresponding stage.

15. Proteid or albuminous yolk is formed when the follicle is 2 layered. It is of mitochondrial origin. It is formed (1) by the mitochondria directly swelling up into yolk in a vesicle or in the bare cytoplasm; (2) by the mitochondria surrounding a vesicle where yolk is elaborated under the influence of mitochondria and is definitely cytoplasmic, being fixed in Bouin slides.

16. The nucleus occupies a central position in the egg in young stages, but moves to the periphery in the older stages, as the egg matures.

17. Nucleolar extrusions are present, at practically all stages of oogenesis. At the stage where the follicle is single layered





·02 m.m. — Figs. 1, 4, 5, 6, 7, 8, 9, 10, 11

·02 m.m. — Figs. 2, 3

they are comparatively fewer. Nuclear activity is very great at the stage where the follicle is double layered and the cytoplasm of the egg is full of beaded extrusions. They become fewer as the egg matures and in the mature condition of the egg they become diminished in size as well as in number.

18. Golgi bodies are seen *intra vitam* in living cells, both before and after the addition of osmic acid. They have a duplex structure, an osmiophilic rim and a central choromophobic portion. They appear as vesicles and crescents.

19. Vacuome is seen after staining with neutral red. It appears first in small patches and later in larger ones.

20. Golgi bodies and Vacuome are separate structures as seen when neutral red and osmic acid are used in fresh preparations one after the other.

21. Mitochondria are seen in green patches after staining with Janus green. The mitochondria exist as rods and granules.

EXPLANATION OF PLATES

The figures were drawn with the help of the Camera Lucida.

Plate I.

Fig. 1. DaFano toned and stained with safranin and light green. Early oocyte where the follicle is one-layered. No zona is present. Golgi bodies are found in the follicle and infiltration takes place.

Fig. 2. DaFano. Toned and stained. Oil immersion diagram. Early oocyte later than Fig. 1. Zona has just appeared. Infiltration takes place.

Fig. 3. DaFano. Toned and stained. Oil immersion diagram, showing a later stage where the zona has developed. Infiltration of Golgi bodies takes place through the intercellular spaces of the follicle in the form of a beaded chain. Intercellular spaces are in close contact with the zona.

Fig. 4. DaFano. Toned and stained with safranin and light green. Follicle is one-layered and has grown. Zona pellucida is well-developed active showing 2 zones, an outer denser, narrower zone and an inner transparent zone. Infiltration is very active. Golgi bodies are present in patches in the follicle close to the zona. Golgi bodies are very numerous in the outer zone of the zona pellucida.

Fig. 5. DaFano, toned unstained. Follicle is in the advanced one layered condition. Wide intercellular spaces are present between the follicle cells. Infiltration is less active. Golgi bodies are present in a rim at the periphery of the egg and the rim has a tendency to spread in.

Fig. 6. Ludford unbleached. Follicle is two-layered. Infiltration is active. Golgi bodies collect in patches close to the zona before infiltrating.

Fig. 7. DaFano, toned. Stained with safranin and light green. Follicle is two-layered. Infiltration is very active. Golgi bodies already in the egg are dispersed in patches.

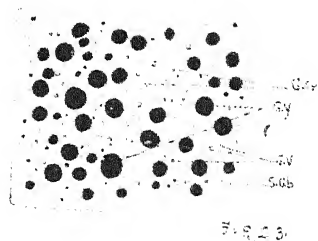
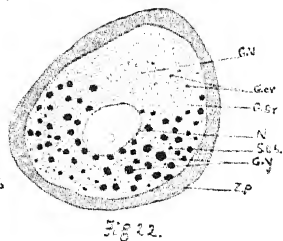
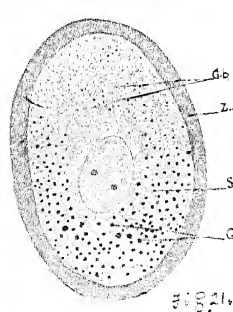
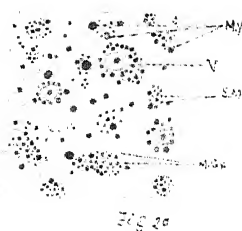
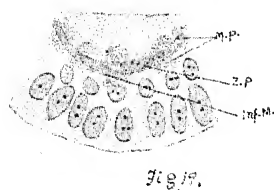
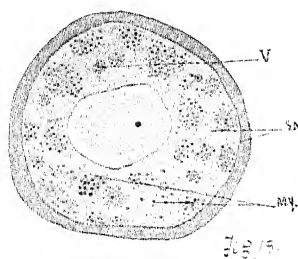
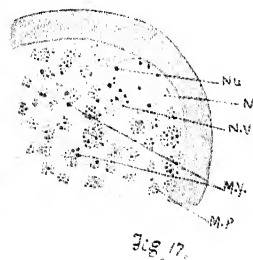
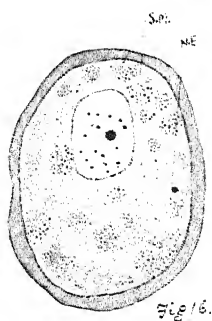
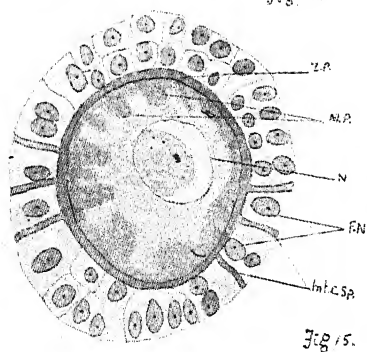
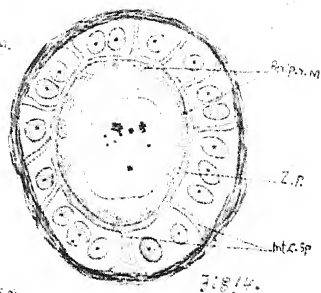
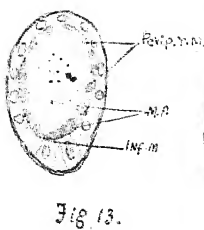
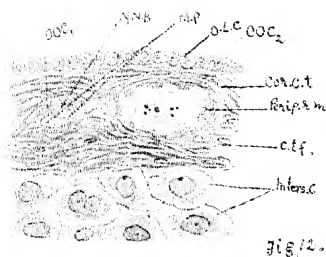
Fig. 8. Ludford. Unbleached. Follicle four-layered. Infiltration of Golgi bodies is very active. Mode of extrusion is haphazard. Golgi yolk is present.

Fig. 9. DaFano, toned and unstained. Theca externa and interna are well marked. Membrana granulosa is three-layered. Infiltration of Golgi bodies is active through all the four membranes i.e. theca externa and interna, membrana granulosa and zona pellucida.

Fig. 10. Theca externa and interna are present membrana granulosa is 4-layered. Infiltration of Golgi bodies is less marked. The Golgi bodies have dispersed evenly in the cytoplasm.

Fig. 11. DaFano. Toned and unstained. Membrana granulosa is 4-5 layered. Vacuoles are present in the cytoplasm and are in place of yolk bodies. Golgi bodies are present between the vacuoles and are granular.





0.02 m.m. — Figs. 12, 13, 14, 15, 16, 17, 18, 21, 22

0.02 m.m. — Figs. 19, 20, 23

Plate 2.

Fig. 12. Regaud-Tupa. Stained with acid fuchsin. A portion of the ovary showing the outer capsular or connective tissue layer. The younger oocyte shows the mitochondria concentrated at the yolk nucleus of Balbiani and also two dispersed patches of mitochondria. The older egg shows the peripheral rim of mitochondria.

Fig. 13. Regaud-Tupa stained with acid fuchsin. Peripheral rim of mitochondria is present in the egg, and infiltration of mitochondria takes place from the follicle which is one-layered.

Fig. 14. Regaud-Tupa stained with acid fuchsin. Advanced stage of the one-layered follicle which has wide intercellular spaces. Peripheral rim of mitochondrial patches are present in the egg.

Fig. 15. Regaud-Tupa stained with acid fuchsin. Follicle is dividing into the two. The peripheral rim of mitochondria is spreading inwards into the egg.

Fig. 16. Champy stained with acid fuchsin. Mitochondria have dispersed evenly in patches many of the mitochondria are swollen. Nucleolar extrusions are present staining like the nucleoli.

Fig. 17. Regaud-Tupa stained with acid fuchsin. Mature stage of the egg showing the germinative vesicle. Mitochondrial yolk is present.

Fig. 18. Regaud-Tupa, stained with acid fuchsin. Follicle is two-layered. Mitochondria are evenly dispersed and swollen mitochondria are visible. Vesicles are present in which swollen mitochondria are lodged. Also vesicles are surrounded by mitochondria.

Fig. 19. Regaud-Tupa. Stained with acid fuchsin. Follicle is two-layered. Infiltration of mitochondria takes place.

Fig. 20. Regaud-Tupa, stained with acid fuchsin. Oil immersion study. Mitochondria are giving rise to yolk. Vesicles are present in the cytoplasm in which yolk is elabo-

rated by mitochondria. Mitochondria are also seen surrounding the vesicles.

Fig. 21. Ludford unbleached showing fatty yolk formation. Yolk collects at one pole of the egg.

Fig. 22. Ludford, bleached by Henneyguy's method shows fatty yolk formation. Yolk collects at one pole. Golgi vesicles and crescents are present.

Fig. 23. Ludford bleached. Oil immersion study. Shows fatty yolk formation. Swollen Golgi bodies are present also large Golgi vesicles and crescents where the fat has dissolved out.

Plate 3

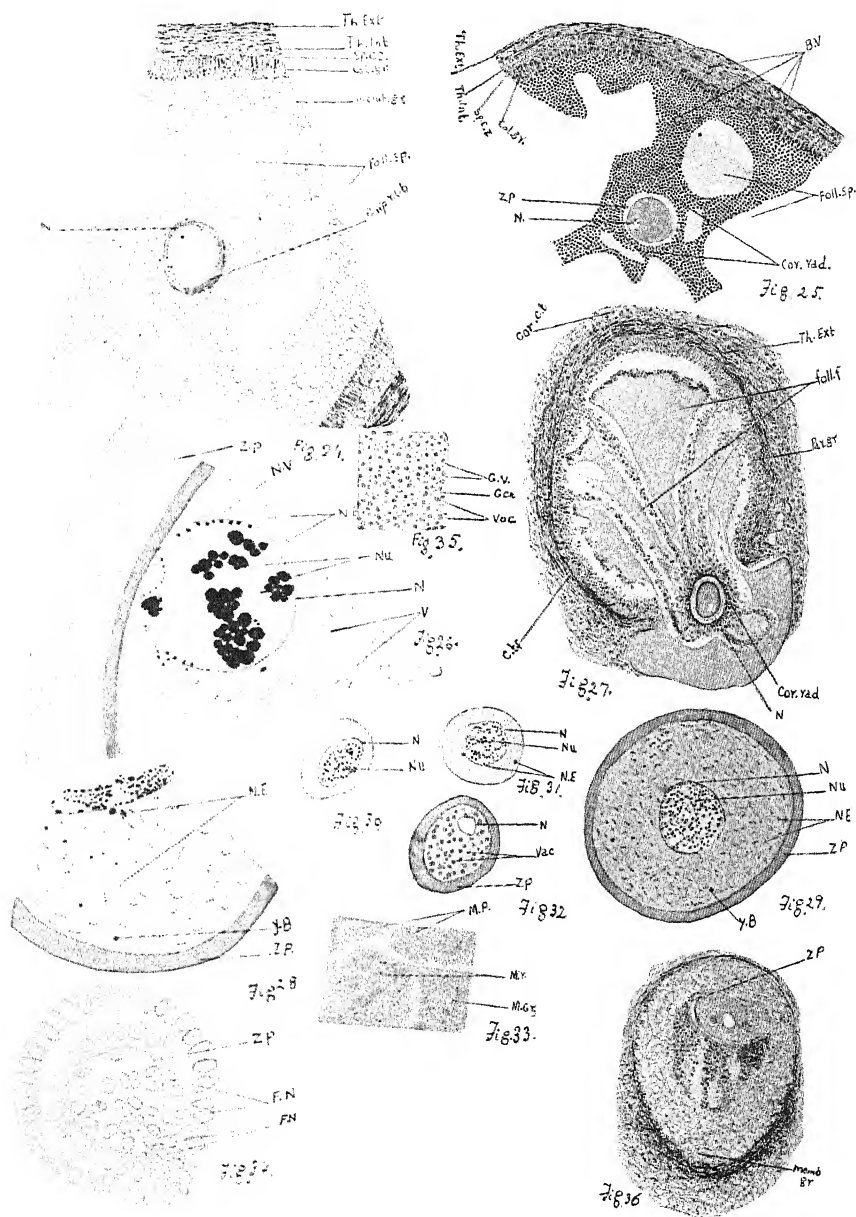
Fig. 24. DaFano. Toned and unstained. A portion of a graffian follicle, showing the following structures. Theca externa and interna, special cell zone, columnar and polyhedral granulosa. Follicular spaces and a mature egg where the golgi bodies are arranged at the periphery in a ring like fashion.

Fig. 25. Bouin stained with eosin and haematoxylin, shows the theca externa and interna with their blood vessels. Large follicular spaces are visible, which have liquor folliculi. The egg is mature and the egg is at the stage of the germinative vesicle.

Fig. 26. Bouin stained with eosin and haematoxylin. Oil immersion study of a small portion of the mature egg. Nucleus is vacuolated. Small and few nucleolar extrusions are present. Vacuoles are seen in the cytoplasm.

Fig. 27. Bouin stained with Mann's methyl blue eosin. Mature graffian follicle, which has ruptured on the inner side into the stroma. Strands of cytoplasm connect the egg to the parietal granulosa.

Fig. 28. Bouin stained with haematoxylin and eosin. Oil immersion study. Follicle is two-layered. Nucleus is very active. Beaded nucleolar extrusions are abundant. Yolk



•02 m.m. — Figs. 24, 25

•02 m.m. — Figs. 29, 30, 31, 32, 34, 36

•02 m.m. — Figs. 26, 28, 33, 35

bodies are visible.

Fig. 29. Bouin stained with haematoxylin and eosin. Follicle is two layered. Nuclear activity is very marked. Nucleolar extrusions are found in abundance, also yolk bodies.

Fig. 30. Bouin stained with eosin and haematoxylin. Follicle is not present. Nucleus is central.

Fig. 31. Bouin stained with haematoxylin and eosin. Follicle is one-layered. A few nucleolar extrusions are present.

Fig. 32. Fresh oocyte seen after treatment with neutral red. Shows the patches of vacuome.

Fig. 33. Oil immersion study of the living egg stained with Janus Green. Showing mitochondrial patches which have granular and rod like mitochondria.

Fig. 34. Regaud-Tupa stained with acid fuchsin. A degenerate egg is seen of which the zona pellucida is distorted. The follicle is two-layered and the follicle cells are proliferating into the egg.

Fig. 35. Portion of a fresh oocyte after treatment with neutral red and osmic acid. Shows vacuome and Golgi bodies as independent structures.

Fig. 36. An advanced graffian follicle showing degeneration DaFano preparation.

Lettering

F. Ep.	..	..	Follicular epethelium
F. N.	..	..	Follicular nucleus
F. C.	..	..	Follicle cells
Foll. f.	..	..	Follicular fluid
Foll. Sp.	..	..	Follicular spaces
C. t. f.	..	..	Connective tissue fibrils
Cor. rad.	..	..	Corona radiata
B. V.	..	..	Blood vessels
Inter C. Sp.	..	..	Intercellular spaces
Inters. C.	..	..	Interstitial cells

Col. gr.	..	..	Columnar granulosa
Memb. gr.	..	..	Membrana granulosa
Par. gr.	..	..	Parietal granulosa
Sp. C. z.	..	..	Special Cell zone
Gb.	..	..	Golgi bodies
Inf. Gb.	..	..	Infiltration of Golgi bodies
P. Gb.	..	..	Patches of Golgi bodies
Perip. r. Gb.	..	..	Peripheral rim of Golgi bodies
B. C. Gb.	..	..	Beaded chain of Golgi bodies
D. P. Gb.	..	..	Dispersed patches of Golgi bodies
Gr. Gb.	..	..	Granular Golgi bodies
S. Gb.	..	..	Swollen Golgi bodies
G. Cr.	..	..	Golgi crescents
G. V.	..	..	Golgi vesicles
G. Y.	..	..	Golgi yolk
M. P.	..	..	Mitochondrial patches
M. Gr.	..	..	Mitochondrial granules
S. M.	..	..	Swollen mitochondria
M. r.	..	..	Mitochondrial rods
M. Y.	..	..	Mitochondrial Yolk
Perip. r. m.	..	..	Peripheral rim of mitochondria
Y. N. B.	..	..	Yolk nucleus of Balbiani
Th. Ext.	..	..	Theca externa
Th. Int.	..	..	Theca Interna
N.	..	..	Nucleus
Nu.	..	..	Nucleoli
N.E.	..	..	Nucleolar extrusions
N.V.	..	..	Nuclear vacuoles
V.	..	..	Vacuoles
Vac.	..	..	Vacuome.
Y. B.	..	..	Yolk bodies
Z. P.	..	..	Zona pellucida
O. L. Z. P.	..	..	Outer layer of Zona pellucida
I. L. Zp.	..	..	Inter layer of Zona pellucida

OOc ₁ OOc ₂	..	.. Oocytes.
O.L.C.	..	.. Outer layer of cells.
Cor. Ct.	..	.. Cortical connective tissue
Inf. M.	..	.. Infiltration of mitochondria

BIBLIOGRAPHY

1. Beams H. W. Studies on the vacuome and Golgi apparatus in the acinar cells of the pancreas of the rat. *Anat. Rec.* Vol. 45.
2. Beams H. W. and Gold Smith J. B. 1931. Golgi bodies vacuome and mitochondria in the salivary glands of the chironomus larva. *Journ. Morph. and Physiol.* Vol. 48.
3. Bhattacharya D. R. 1925. Les inclusions Cytoplasmique dans L'oogense de ceration reptiles These De Paris.
4. Bhattacharya D. R. and Das R. S. 1929. Golgi body and vacuome. *Nature*, Nov. 2.
5. Bhattacharya D. R. Das R. S. and Datta S. K. 1929. On the infiltration of Golgi bodies from the follicular epethelium to the egg. *Zeit. Zellf Mikr. Anat Bd.* 8.
6. Bhattacharya D. R. and Lal K. B. 1929. The cytoplasmic inclusions in the Oogenesis of certain Indian tortoise Allahabad University Studies, Vol. 6.
7. Bhattacharya D. R. and Mathur C. B. 1929. Cytoplasmic inclusions in the Oogenesis of Pila. Allahabad University Studies, Vol. 6.
8. Bhattacharya D. R. and Banerji S. P. 1932. On the cytoplasmic inclusions in the Oogenesis of *Scylla serrata*. Allahabad University Studies, Vol. III. Part II. 1932.
9. Bhattacharya P. R. The infiltration of Golgi bodies from the follicular epethelium to the egg in mammals. Allahabad

University Studies 7.

10. **Brambell F. W. R.** 1925 a. The Oogenesis of fowl. Phil. Trans. Royal Soc. London.
11. **Brambell F. W. R.** 1924. The nature and origin of yolk. Br. Journ. Expt. Biol. Vol. 1.
12. **Clement R.** Cytoplasmic inclusions in the oogenesis of *Sciurus palmarum*, Allahabad University Studies. Vol. X No. 10. Science section 1933.
13. **Cowdry.** Special Cytology.
14. **Das R. S.** 1930. Cytoplasmic inclusions in the oogenesis of birds.
15. **Engle T. E.** A quantitative study of follicular atresia in the mouse. American Journal of Anatomy 1927.
16. **Gatenby J. B.** Notes on the gametogenesis of *Ornithorhynchus paradoxus*. Q. J. M. S. 66, 1922 Part III.
17. **Gatenby J. B.** The prozymogen granules of *R. Bensley* and the modern neutral red cytology. Amer. Journ. Anat., Vol. 48, 1932 d.
18. **Gresson R. A. R.** A study of the cytoplasmic inclusions and nucleolar phenomena during the oogenesis of mouse. Q. J. M. S. Vol. 75, part IV, Feb. 1933.
19. **Harvey L. A.** Oogenesis of *Carcinus maenas* Penn with special reference to yolk formation. Trans. Royal Society, Edinburgh, Vol. 56, 1929.
20. **Hirschler Jan.** 1918. Ueber die Plasmakomponenten der weiblichen Geschlechtszellen Arch. Mikr. Anatomy 89 (quoted by Wilson).
21. **Hogben L.** 1929 b. *Periplaneta* P. R. S. B. Vol. 91.
22. **Kingery H. M.** 1914. So-called parthenogenesis in the white mouse. Biol. Bull, Vol. 27, pp. 240-251.

23. **Krujukowa Z.** Observations cytologiques Sur les glandes salivaires de la larva du chironome Arch. Ruso d'anat Hist. Embryol T. 8. 1929 (quoted Beams).
24. **Leob Lco. 1915.** An early state of experimentally produced extra uterine pregnancy and spontaneous parthenogenesis of the eggs in the ovary of the guinea pig. Biol. Bull. Vol. 28, p. 59.
25. **Levi G. 1915.** Il comportamento dei condrio some durante i piu precoci periodi dello Svilluppodei mammiferi arch f. Zellforsch.
26. **Monterosso B.** Su L'origine la costituzione dei materiali deuto plasmici nell oocyte in accresciment dei mammiferi arch f. Zellforsch 13.530, 1915.
27. **Nath V. and Nangia M. D.** A demonstration of the vacuome and the Golgi apparatus as independent cytoplasmic constituents in the fresh eggs of teleostean fishes. Journ. Morph. and Physiol. Vol. 52, 1931.
28. **Nihoul J. 1926.** Recherches sur L'appareil endo-cellulaire de Golgi dans les premiers stades de development des mammiferes La cellule 37. 23.
29. **Parat M. Et. Painleve. J.** Constitution du cytoplasme d'une cellule glandulaire la cellule des glandes salivaires de la larve du chironome C. R. Acad. Sci. I 179. 1924 a.
30. **Ibid.** Observations vital d'une cellule glandur laire en activite. nature et role de l'appareil reticulaire interno de Golgi etc. de L'appareil de Holmgren ibid 1924 b.
31. **Ibid.** Appareil reticulaire interno de Golgi trohosponge de Holmgren et vacuome ibid 1924 d.
32. **Rio Hortega** Details nou-veaux sur la structure de l'ovaire Trab lab. Invest Biolog tom 11. 1913.
33. **Retzius G. 1889.** Die inter zellularbrücken des Eierstockeils Und du Follikclzellen So wie über die Entwickeling

- der zona pellucida vern. d. Anal. Ges. Berlin, pp. 10—11.
34. **Russo A. 1610.** Sui mutamenti che. Subisous cons. i. mitochondried i. materiali deutoplasmicidell' oociti diconiglia in diversi periodidi inanizione. Arch f. Zellforsch 5.173.
35. **Sjovall E.** Ein versuch das Binnennetz von Golgi Kopsch bei der spermat und ovogenese zu homologisicren Anat. Anz. 28, 561.
36. **Thing A. 1918.** The formation and structure of the zona pellucida in the ovarian eggs of turtles. Am. J. Anat. 23. 237.
37. **Van Beneden E. 1880.** Contenbution a la connaissance de l' ovaire des mammiferes. Arch. de Biol. T. I. pp. 475-557.
38. **Van der stricht. o. 1923.** Etude comparee des ovules des mammiferes anx differentes periodes de l'ovogense de' apres les liavanx de Laboratorre d' Histologie et d' Embryologie de l' Universite' de Gand. Arch. De. biol. 33, 229.

